

# **PROCEEDINGS**

of the  
**California Academy of Sciences**  
(Series 4)



**December 17, 2018 \* Volume 65 \* Supplement III**  
**Institute for Biodiversity Science & Sustainability**



CALIFORNIA  
ACADEMY OF  
SCIENCES

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Front cover: *Pison woji* (p. 499, Fig. 1202)

#### COVER DESIGN

Alan E. Leviton & Gary C. Williams  
California Academy of Sciences

ISSN 0068-547X

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Published by the California Academy of Sciences  
55 Music Concourse Drive, Golden Gate Park,  
San Francisco, California 94118 U.S.A.

Printed in the United States of America by  
Allen Press Inc., Lawrence, Kansas 66044



# A Revision of the Wasp Genus *Pison* Jurine, 1808 of Australia and New Zealand, New Guinea, and the Pacific Islands (Hymenoptera: Crabronidae)

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The species of *Pison* of Australia and New Zealand, of New Guinea, and of the Pacific Islands are revised and illustrated. The revision includes a diagnosis of the genus, differential diagnoses and descriptions of all species from these regions, and keys to species identification (one key for each of the three areas). Newly discovered taxonomic characters are utilized in keys, species diagnoses, and species descriptions. The available information on nesting habits is summarized. The following 117 are the new species from Australia: *abductor*, *acutum*, *adnyamathanha*, *angulare*, *angustivertex*, *antennatum*, *argentifrons*, *argyrotrichum*, *aridum*, *aterrimum*, *austrium*, *batavum*, *bicellulare*, *bimbi*, *brachyceras*, *breviclypeatum*, *brevicorne*, *carinigerum*, *cicatricosum*, *clypeare*, *compressum*, *congener*, *contiguum*, *curiosum*, *dentatum*,

*deplanatum*, *dispar*, *ecarinatum*, *elatum*, *elongatum*, *emarginatum*, *eurygnathos*, *excisum*, *flagellarium*, *flexum*, *formicarium*, *formosum*, *fossor*, *frontale*, *globosum*, *gracile*, *gregorii*, *gymnopareion*, *hirsutum*, *hirticeps*, *hypostomale*, *illecebrosus*, *impressiventre*, *incurvatum*, *inuitatum*, *kalbarri*, *kurandae*, *laeviventer*, *laterirugosum*, *laticeps*, *leonorae*, *leptogaster*, *longulum*, *lucens*, *minutum*, *modestum*, *naralte*, *nigricans*, *nitens*, *notochthonum*, *novaecambriae*, *nubilipenne*, *nudigenale*, *occidentale*, *occultans*, *oceanicum*, *ocellare*, *oculare*, *orbitale*, *ovale*, *parvum*, *pauper*, *penicillatum*, *petraeum*, *pilbara*, *pilifrons*, *prostratum*, *protrudens*, *psammophilos*, *pseudocillatum*, *pumilio*, *punctatum*, *punctifemur*, *pusillum*, *quinquecarinatum*, *radians*, *rarum*, *rotundum*, *rufigaster*, *rufotibiale*, *scutatum*, *setiferum*, *setosum*, *simplex*, *sinuosum*, *spilopteryx*, *stenometopon*, *subtile*, *sulcatum*, *tegulare*, *tenuipunctatum*, *tenuisculptum*, *terrigena*, *tomentosum*, *translucens*, *trichops*, *tridentatum*, *trilobatum*, *triodon*, *varipes*, *xanthognathos*, and *xenognathos*, whereas three new species from New Guinea are: *metallescens*, *oresbios*, and *pandambai*.

The following new synonyms are established (the valid name is listed last): *Pison sarawakense* Cameron, 1903 and *Pison ignavum* Turner, 1908 = *Pison argentatum* Shuckard, 1838; *Pison aureosericeum* Rohwer, 1915 and *Pison exornatum* Turner, 1916 = *Pison auratum* Shuckard, 1838; *Pison dimidiatum* F. Smith, 1869 and *Pison inconspicuum* Turner, 1916 = *Pison decipiens* F. Smith, 1869; *Pison scabrum* Turner, 1908 = *Pison fenestratum* F. Smith, 1869; *Pison pallidipalpe* F. Smith, 1863, *Pison tahitense* de Saussure, 1867, *Pison hospes* F. Smith, 1879, *Pison fraterculus* Turner, 1916, and *Pison strenuum* Turner, 1916 = *Pison marginatum* F. Smith, 1856; *Pison pelletieri* Le Guillou, 1842 and *Pison ruficorne* F. Smith, 1856 = *Pison peletieri* Le Guillou, 1841; *Pison nitidum* F. Smith, 1859, *Pison collare* Kohl, 1884, *Pison papuanum* W. Schulz, 1905, *Pison bismarckianum* Tsuneki, 1982, and *Pison biroi* Tsuneki, 1983 = *Pison punctifrons* Shuckard, 1838; *Pison fuscipenne* F. Smith, 1869 and *Pison punctulatum* Kohl, 1884 = *Pison perplexum* F. Smith, 1856; *Pison meridionale* Turner, 1916 = *Pison simillimum* F. Smith, 1869; *Pison pulchrum* Turner, 1916 = *Pison vestitum* F. Smith, 1856; *Pison obliquum* F. Smith, 1856, *Pison iridipenne* F. Smith, 1879, *Pison strictifrons* Vachal, 1907, *Pison impunctatum* Turner, 1912, *Pison korrorense* Yasumatsu, 1937, and *Pison doggonum* Menke, 1988 = *Pison westwoodii* Shuckard, 1838; *Pison susanae* Cheesman, 1955 = *Pison novocaledonicum* Krombein, 1949.

*Pison punctifrons* of the XX<sup>th</sup> and XXI<sup>st</sup> century authors is actually *Pison suspiciosum* F. Smith, 1858. The latter name is resurrected from synonymy with *Pison punctifrons*, and *Pison fabricator* F. Smith, 1869, *Pison striolatum* Cameron, 1897, *Pison lagunae* Ashmead, 1904, *Pison javanum* Cameron, 1905, and *Pison japonicum* Gussakovskij, 1937 are newly treated as its junior synonyms.

A number of lectotypes have been designated.

## INTRODUCTION

GENERAL.— It took eight years (2010–2018) to complete this revision. Initially I intended to consider the Australian species only. I soon realized, however, that a number of species are shared by Australia and the island of New Guinea on one hand, and by Australia and the Pacific Islands on the other. Therefore, I decided to enlarge my study to encompass all three areas. Pacific Islands, as here defined, extend from the Solomon Islands and New Caledonia in the West to the Hawaiian and Pitcairn islands in the East, and to Guam and Wake Atoll in the North. New Britain is considered to be a part of Papua New Guinea, and Christmas Island a part of Australia (to which it belongs politically, although it is closer geographically to Indonesia). Species of New Zealand are treated together with those of Australia.



**METHODS AND TECHNICAL TERMS.**— The specimens were examined under a Leica MZ APO stereomicroscope with a fluorescent light illuminator. The illustrations of external morphological characters were generated through the Automontage software package by Syncroscopy, and those of male sternum VIII and of the male genitalia under a Leo 1450VP and later Hitachi SU3500 scanning electron microscopes. For each species, I indicate not only the body length, but also the head width, which is a more precise measurement according to Ohl and Thiele (2007). Measurements were made using an ocular micrometer with the scale interval of 0.1 mm. Molecular techniques and a cladistic analysis of the species relationships have not been attempted.

Most of the morphological terms are as in Bohart and Menke (1976). Those not included in their work or needing clarification are defined below:

- Abductor ridge:** this term, coined by Pulawski (1995), indicates a ridge emerging from the abductor mandibular swelling and running approximately parallel to the condylar ridge (= posterior mandibular margin). Not to be confused with the adductor ridge.
- Acetabular groove:** a setiferous, longitudinal groove on the outer surface of the mandible between the acetabular carina and the outer ridge, typically starting near the mandibular acetabulum (= anterior mandibular articulation), but at some distance from it in some species, and separating the anterior and the outer mandibular surfaces (Michener and Fraser, 1978).
- Clypeal lamella:** the most ventral, unsculptured and asetose part of the middle clypeal lobe, adjacent to lobe free margin; sometimes called clypeal lip (e.g., Bohart, 1962; Pulawski, 1995).
- Condylar groove:** a setiferous, longitudinal groove parallel to the posterior mandibular margin, typically starting near the mandibular condyle (= posterior mandibular articulation), but at some distance from it in some species (Michener and Fraser, 1978).
- Episcrobal area:** the portion of the mesopleuron above the scrobal groove and below the subalar fossa (Budrys, 1990, 1993). Bohart and Menke (1976) called it the hypoepimeral area, a morphologically inaccurate term meaning “area under the epimeron”.
- Gonocoxite:** the most external part of the male genitalia. It was called gonostyle by Bohart and Menke (1976), but most recent workers prefer gonocoxite (e.g., Pulawski and Prentice, 2008).
- Humeral plate:** a sclerotized plate located basad of the origin of the costal and subcostal veins of the forewing and partly covered by the tegula.
- Intersubmarginal veins:** the 1<sup>st</sup> and 2<sup>nd</sup> radiomedian crossveins of the forewing.
- Lower interocular distance:** the shortest distance between the eyes adjacent to the clypeus or near the ventral level of the antennal sockets (Menke, 1988).
- Ocellocular distance:** the shortest distance between the outer margin of a hindocellus and the adjacent orbit.
- Parapsidal lines:** used in the traditional sense, as recommended by Menke (1993).
- Psammophore:** a row of erect setae on the lower gena (e.g., Figs. 874, 937), mandibular posterior margin, and forefemoral venter that help in sweeping or carrying away sand grains during nest construction (Bohart and Menke, 1976:24).
- Scutal flange:** the lateral upturned edge of the scutum that borders the tegula (Menke, 1988). Called parasutal carina by Tulloch (1935), Gibson (1985), and Ronquist and Nordlander (1989).
- Scutum:** an abbreviated term for the mesoscutum.
- Sternum (plural: sterna):** an abbreviated term for the gastral sternum (sterna).
- Tegula enlarged:** used when the tegula is larger than in *Pison atrum* (Spinola), the type species of the genus.
- Tergum (plural: terga):** an abbreviated term for the gastral tergum (terga).
- Trimmal carina:** the cutting edge of the mandible, or the inner mandibular edge (Michener and Fraser, 1978).
- Upper interocular distance:** the shortest distance between the eyes at the vertex, measured behind the ocellar triangle (Menke, 1988).

**ORIGIN OF MATERIAL.**— This paper is based on the material kindly sent by the institutions listed below and also on the specimens collected by the author and his wife, Veronica Ahrens, during eight expeditions to Australia (2006-2012) totaling 12 months, and by the author in Papua New Guinea in 1987 and 1988. The number of specimens examined from Australia and New Guinea



totals 13,497, and of those from the Pacific Islands 1077. The institutions are referred to in the text by their respective capitalized abbreviations preceding the institutions full name below (the name of the person responsible for sending specimens is given in parentheses).

AEI: American Entomological Institute, formerly Gainesville, Florida, currently Logan, Utah, USA.

AMNH: American Museum of Natural History, New York, New York, USA (John S. Ascher).

AMS: Australian Museum, Sydney, New South Wales, Australia (Derek Smith).

ANIC: Australian National Insect Collection, Canberra, Australian Capital Territory, Australia (Nicole Fisher).

BISH: The Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA (James Boone).

BMNH: The Natural History Museum (formerly British Museum Natural History), London, United Kingdom (David G. Notton).

CAS: California Academy of Sciences, San Francisco, California, USA.

ELKU: Entomological Laboratory, Kyushu University, Fukuoka, Japan (Toshiharu Mita).

IANC: Institut Agronomique Néo-Calédonien, La Foa, New Caledonia (Christian Mille, Sylvie Cazères).

MHNG: Muséum d'Histoire Naturelle de Genève, Genève, Switzerland (Bernard Landry).

MNHN: Muséum National d'Histoire Naturelle, Paris, France (Agnès Touret-Alby).

MNKB: Museum für Naturkunde, Institut für Systematische Zoologie (formerly Zoologisches Museum der Humboldt Universität), Berlin, Germany (Michael Ohl).

MTM: Magyar Természettudományi Múzeum, Budapest, Hungary (Zoltán Vas).

NHMW: Naturhistorisches Museum, Wien, Austria (Dominique Zimmermann, Manuela Vizek).

NTM: Museum and Art Gallery of the Northern Territory, Darwin, Northern Territory, Australia (Gavin Dally).

OMNH: Osaka Museum of Natural History, Osaka, Japan (Rikio Matsumoto).

OXUM: Hope Entomological Collections, Oxford University Museum of Natural History, Oxford, United Kingdom (James E. Hogan).

QMB: Queensland Museum, Brisbane, Queensland, Australia (Chris Burwell, Karin Koch, Susan Wright).

RMNH: Naturalis Biodiversity Center (formerly Rijksmuseum van Natuurlijke Historie), Leiden, the Netherlands (Frederique Bakker).

SAM: South Australian Museum, Adelaide, South Australia, Australia (Peter Hudson).

UCD: Richard M. Bohart Museum of Entomology, University of California, Davis, California, USA (Lynn S. Kimsey).

USNM: United States National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA (Brian Harris).

USU: Utah State University, Logan, Utah, USA (Terry L. Griswold, Frank D. Parker).

WAM: Western Australian Museum, Perth, Australia (Brian Hanich).

ZIN: Zoological Institute, Russian Academy of Sciences, Sankt-Petersburg, Russia.

ZMUC: Zoological Museum, University of Copenhagen, Copenhagen, Denmark (Lars Vilhelmsen).

**SPECIES DESCRIPTIONS.** – Repetitive characters that occur in the majority of species have been omitted. If not indicated otherwise, the following states apply:

distance between antennal socket and adjacent orbit greater than socket width;

frons with middle supraantennal carina, without oblique ridge above each antennal socket;

eye asetose or microscopically setose (with short, erect setae in *P. deplanatum* and *P. trichops*);

mandible: ventral margin gradually curving toward apex, apex simple, not truncate nor tridentate; abductor ridge absent (present in *P. abductor* and *P. tridentatum*); acetabular groove with one row of punctures.

occipital carina not expanded, not joining hypostomal carina;

hypostomal carina not expanded;

propleuron densely punctate (punctures less than one diameter apart);

tegula not enlarged, not totally covering the humeral plate, impunctate posterolaterally, its outer margin evenly convex;



mesopleuron not depressed between postspiracular carina and episternal sulcus (or between pronotal lobe and episternal sulcus when the postspiracular carina is absent);  
scutellum not foveate along anterior margin;  
propodeal dorsum with middle carina in shallow sulcus, obliquely ridged (ridges not becoming more conspicuous laterally);  
propodeal side not concave;  
forewing with three submarginal cells, second recurrent vein received near second intersubmarginal vein or interstitial with it;  
posteroventral forefemoral surface closely punctate;  
hindcoxal dorsum with outer margin sharply carinate;  
female gena punctate and setose on both sides of oral fossa; mandible and forefemur without psammophores;  
female tergum VI pointed, without longitudinal carina;  
male clypeal lamella sharply pointed;  
male flagellum without tyloids;  
male flagellomeres cylindrical;  
male tergum VII with apical margin straight or nearly so.

### GENUS *PISON* JURINE

- Pison* Jurine in Spinola, 1808:255. Type species: *Pison jurini* Spinola, 1808 [correctly *jurinei* = *Alysson ater* Spinola, 1808], by monotypy.  
*Tachybulus* Latreille, 1809:75. Type species: *Tachybulus niger* Latreille, 1809 [= *Alysson ater* Spinola, 1808], by monotypy.  
*Nephridia* Brullé, 1833:408. Type species: *Nephridia xanthopus* Brullé, 1833, by monotypy.  
*Pisonitus* Shuckard, 1838:79 (as division of *Pison*). Type species: *Pison argentatum* Shuckard, 1838, designated by Pate, 1937:51.  
*Pisum* Agassiz, 1846:293, junior homonym of *Pisum* Megerle, 1811. Unjustified emendation of *Pison* Jurine, 1808.  
*Pisonoides* F. Smith, 1858:104 (authorship attributed to Shuckard, as subgenus of *Pison*). Type species: *Pison obliteratum* F. Smith, 1858, by monotypy.  
*Parapison* F. Smith, 1869:298. Type species: *Pisonoides obliteratus* F. Smith, 1858, designated by Pate, 1937c:47.  
*Pseudonysson* Radoszkowski, 1876:104 (as *Pseudo-Nysson*, incorrect original capitalization and hyphenation). Type species: *Pseudonysson fasciatus* Radoszkowski, 1876: by monotypy.  
*Taranga* W.F. Kirby, 1883:201. Type species: *Taranga dubia* W.F. Kirby, 1883 [= *Pison spinolae* Shuckard, 1838], by monotypy.  
*Paraceramius* Radoszkowski, 1887:432, junior homonym of *Paraceramius* de Saussure, 1854. Type species: *Paraceramius koreensis* Radoszkowski, 1887, by monotypy.  
*Pisum* W. Schulz, 1906:212, junior homonym of *Pisum* Megerle, 1811 and *Pisum* Agassiz, 1846. Unjustified emendation of *Pison* Jurine, 1808.  
*Krombeiniellum* Richards, 1962:118. Substitute name for *Paraceramius* Radoszkowski, 1887.

**GENERIC DIAGNOSIS.** — *Pison*, a widely distributed genus of crabronid wasp found on all continents except Antarctica and North America (where only the adventive *P. koreense* [Radoszkowski] occurs), is characterized by an emarginate inner eye margin, the antennal socket contiguous with the frontoclypeal suture, and the presence of two or three submarginal cells, the second of which is petiolate. Four other genera share these characters: *Aulacophilus* F. Smith, *Aulacophilinus* Lomholdt, *Entomopison* Menke, and *Pisonopsis* W. Fox. These genera differ as follows:

1. *Aulacophilus* has a conspicuously, longitudinally ridged mesopleuron, a transverse preapical ridge on the propodeum, the propodeal apex truncate, and gastral segment I almost as long as the remaining gaster and divided into a narrow basal petiole and a contrastingly nodose posterior

part (the propodeal characters were first observed by Antropov, 1999). In *Pison*, the mesopleuron is not ridged, the propodeum has no preapical ridge and its apex is slightly projecting mesally, and the gaster is either sessile (the vast majority of species), or segment I is pedunculate, with the length exceeding the maximum width, but shorter than the remaining gaster (*difficile*, *eurygnathos*, *icarioides*, *obliteratum*, *pistillum*, and *woji*; in *eurygnathos* and *icarioides* segment I is bulging apically, in *woji* the basal portion is somewhat approaching the condition of *Aulacophilus*).

2. *Aulacophilinus* was described in 1980, but most of its species were kept in *Pison* until the genus was properly defined by Menke (2016) and Pulawski (2017). It is characterized by a mandible that is unique within the Trypoxylini: both the outer and inner surfaces are punctate and setose throughout (except narrowly impunctate and asetose adjacent to the apical margin), the acetabular and condylar grooves are absent, and the inner margin is broadly expanded preapically, thus forming an apical truncation (the apical margin of the truncation being slightly concave). Unlike *Pison*, the clypeus is punctate throughout, without a shiny, medioventral lamella. *Pison eurygnathos*, however, is somewhat intermediate between *Aulacophilinus* and *Pison*: the clypeus without a lamella and the broadened preapically inner mandibular portion are as in *Aulacophilinus*. Unlike *Aulacophilinus*, however, the inner mandibular surface is impunctate and glabrous (as in *Pison*), and the following are unique: two large preapical teeth on the inner mandibular margin, a broad, shallow condylar groove, and a sharp, conspicuous acetabular carina. Also, the setae on tergum I are erect (appressed in *Aulacophilinus*).

3. Menke, in 1968, described *Entomopison* as a subgenus of *Pison*, and he raised it to full genus status in 2016. The genus is characterized by the conspicuously notched posterior mandibular margin, but otherwise it is a typical *Pison*. In *Pison*, the posterior mandibular margin is either straight (vast majority of species), or stepped (*P. nogorombu*), or slightly emarginate (the fossil *P. electrum* Antropov and Pulawski).

4. To separate *Pison* and *Pisonopsis*, Bohart and Menke (1976:330) used four characters, as tabulated below:

Character	<i>Pison</i>	<i>Pisonopsis</i>
Marginal cell of forewing	in most species acute distally, extending well beyond outer veinlet of submarginal cell III.	rounded or truncate distally, slightly extending beyond outer veinlet of submarginal cell III.
Mandibular posterior margin	not notched, except emarginate in some Neotropical species (which are now separated as <i>Entomopison</i> ).	emarginate or conspicuously angulate
Oblique grooves on sterna III-IV	absent	present
Female tergum VI	conical	flattened or with pygidial plate delimited by carinae

Menke (1988:5) questioned the usefulness of these characters, correctly calling them “rather tenuous”. According to him, the only reliable difference between the two genera was in the mandible, whose outer surface is simple in *Pison*, but has an additional carina (that I call abductor ridge) in *Pisonopsis*. The abductor ridge, however, is also present in many *Pison insulare* of the Pacific Islands and in two new Australian species (*P. abductor* and *P. tridentatum*), rendering this difference ineffective. Separation of *Pison* and *Pisonopsis*, however, is easier now, after Menke (2016) recognized as the genus *Entomopison* those species with emarginate mandibles: in *Pison*, the mandibles are either entire, or (*P. nogorombu*) stepped, or slightly emarginate (the fossil



*P. electrum*), whereas they are emarginate or conspicuously angulate in *Pisonopsis*. *Pisonopsis* differs from *Entomopison* in having the abductor carina (which is absent in the latter genus).

**NESTING BEHAVIOR.** — Observation on nesting habits of the Australian *Pison* accumulated in parallel to species descriptions. Maindron (1879) was the first with observations on *P. fenestratum* (that he called *P. nitidum*), although his observations were conducted on the island of Ternate in the Moluku Islands and his identification of the species is far from certain. Roth (1885) described the nests of *P. spinolae* and *P. perplexum*, although the first species was almost certainly misidentified and the second is actually *P. argentatum*. Froggatt (1894), Richards (1930), Cowley (1962), Sharell (1971), Naumann (1890a), Valentine and Walker (1991) and Harris (1994) published on the nesting of *P. spinolae* (Richards also on *P. viosum*, and Harris also on *P. morosum*), and Cowley (1962) described its egg and larva. Cheesman (1928) observed the nesting habits of *P. argentatum* (as *P. ignavum*), Evans (1981) that of four species nesting in the soil, and Naumann (1983) that of *P. auratum*. Evans, Matthews, and Hook (1981) described the nesting habits of six species. Pagden (1934) and Iwata (1964b) observed the nesting habits of *P. punctifrons*, respectively in Malaysia and in Japan.

Evans, Matthews, and Hook (1981) recognized three types of nesting among the Australian species. The first includes the species that nest in pre-existing cavities. Cells are separated by thin mud partitions and the nest is often closed off with a thick mud plug. This type is represented by *Pison marginatum*, *P. spinolae*, and *P. westwoodii*, although *P. spinolae* is also known to build free mud nests. *Pison suspiciosum* nests in bamboo tubes as well as in beetle burrows in wood, although Pagden (1934) reported it as building free nests out of mud. *Pison auratum*, which nests in abandoned nests of *Sceliphron laetum* (F. Smith) according to Naumann (1983), should also be categorized here, as well as *P. morosum* of New Zealand, which nests in abandoned galleries of wood-boring insects (Harris, 1994), *Pison nigellum* of the Pacific Islands that nests in clay cliffs (Krombein, 1950), and the Old World species *P. atrum* (Spinola), *P. rugosum* F. Smith, and *P. strandi* Yasumatsu which nest in plant stems or beetle burrows (Bohart and Menke, 1976), as well as the South African *P. allonymum* W. Schulz, that nests in old or abandoned nests of *Bembecinus cinguliger* (F. Smith) and *B. oxydoreus* (Handlirsch) or in vertical banks (Gess, 1981).

Members of the second type build free mud nests consisting of several cells attached to stems, roots, or leaves and coated with mud in such a way that the cells are not individually discernible from the outside. Evans, Matthews, and Hook (1981) listed only two species, *P. ignavum* and *P. rufipes*, as belonging here, but *P. viosum* also belongs here according to Richards (1930). I suspect that most of the Australian species build nests of this type, because the adults can be seen, often in great numbers, as they collect mud from shores of stagnant waters, either large pools of small rain puddles. *Pison argentatum* and the Old World species *P. erythropus* Kohl, *P. koreense* (Radoszkowski) and *P. obliteratum* F. Smith also belong here (Bohart and Menke, 1976).

The third type includes the species that nest in the ground and do not use mud at any stage of the nest construction. They carry the material extracted from the nest during the nest excavation using their psammophores and drop it in flight. Two species, *P. areniferum* and *P. auriventre*, were actually observed during nest digging (Evans, 1981), but two others, *P. barbatum* and *P. ciliatum*, were assigned to this type based on the possession of psammophores. Many more species with at least a genal psammophore are recognized in the current paper: *P. argentifrons*, *P. aterrimum*, *P. contiguum*, *P. dentatum*, *P. fossor*, *P. kurandae*, *P. laticeps*, *P. minutum*, *P. notochthonum*, *P. occidentale*, *P. psammophilos*, *P. punctatum*, *P. pusillum*, *P. radians*, *P. setiferum*, *P. stenometopon*, *P. tomentosum*, *P. tridentatum*, *P. triodon*, and *P. xenognathos*. Apparently they all nest in the ground. According to Janvier (1928), *P. chilense* Spinola also nests in the ground. The female of this species, however, does not possess a psammophore — to dig a nest, she brings some water to



soften the ground, and then uses her mandibles first and then her forelegs to remove particles of the soil.

Like all other Trypoxylini, members of *Pison* prey upon small spiders, although they are great differences between the prey species. For example, *P. rufipes* preys upon Salticidae, while *P. marginatum*, *P. spinolae*, and *P. westwoodii* make extensive use of orb-weaving spiders, primarily of Araneidae (Evans, Matthews, and Hook, 1981), although Nephilidae are also used by *P. marginatum* (Gibson Hill, 1950), and Tetragnathidae by *P. spinolae* (Evans, Matthews, and Hook, 1981). *Pison suspiciosum* preys on Agelenidae, Araneidae, Salticidae, Tetragnathidae, and Theridiidae (Katayama, 1934; Iwata, 1964), and also on Oxyopidae (Krombein and Norden, 2001) and Lycosidae (Starr, 2004). *P. areniferum*, *P. barbatum*, and *P. ciliatum* collect Oxyopidae, and *P. auriventre* preys on Lycosidae (Evans, 1981).

### *PISON* OF AUSTRALIA AND NEW ZEALAND

The fauna of the Australian *Pison* is extraordinarily rich, far exceeding the numbers of its congeners in the other Zoogeographic Regions. Taking into account the new synonymies and the four species recently transferred to *Aulacophilinus*, 45 species are currently known from the continent. In this paper, I recognize 163 species, 117 of which are new. In comparison, 44 species occur in the Neotropical Region according to the recent revision by Menke (1988), with one species added by Antropov (1996), 21 occur in Sub-Saharan Africa excluding Madagascar (Leclercq, 1965), 12 in China (T. Li and Q. Li, 2011), and 10 in the Philippines (Tsuneki, 1983a).

Beyond the 163 species that I now recognize from Australia, there remain an indefinite number of forms that are difficult to characterize. Most of these are all black and small to medium size, and lack conspicuous distinctive features. These forms are represented by only one or a few specimens each in the material studied, making it difficult to determine whether they are new species, or variants or geographic races of recognized species, or opposite sexes of species known from one sex only. Certainly, the number of the Australian *Pison* will significantly increase when these forms are clarified.

Clearly, the current study cannot be regarded as a definitive or final revision of the Australian *Pison*. I like to think, nevertheless, that it is a significant step forward in our knowledge of this wasp genus.

**TAXONOMIC HISTORY OF AUSTRALIAN *PISON*.** – Shuckard (1828), the first author who dealt with the Australian *Pison*, described *P. rufipes*, *P. spinolae*, and *P. westwoodi*. He was followed by Le Guillou (1841) who described *P. peletieri*, and by F. Smith who described four species in 1856 and eleven in 1869. Kohl (1884), Turner (1908, 1915), and Rohwer (1915) added one, fourteen and one, and two species, respectively, and Turner (1916) described an additional eleven. Evans (1981) with three species, and Menke (2015) with one species, are the latest additions. Fifteen of these names are now junior synonyms. The *caliginosum* species group of *Pison*, revised by Naumann (1990), is now regarded as belonging to *Aulacophilinus* (Menke, 2016; Pulawski, 2017).

In 1915, Turner published a key to the four known Tasmanian species; in the key he incorrectly attributed to *P. westwoodii* the second recurrent vein joining the second submarginal cell. In the following year, he (Turner, 1916) published the first and so far the only key to all Australian species. He took into consideration the 50 species known by then, and he was able to study firsthand the species described by F. Smith. The key, however, contained less than a third of the species now known to occur in Australia. It also contained three grave errors: *P. peletieri*, *P. vestitum*, and Turner's own *P. scabrum* were assigned to wrong key sections. Because of his limited material, Turner was not able to appreciate the amount of individual variation and treated as valid the following six



species that actually are junior synonyms: *P. aureosericeum*, *P. exornatum*, *P. fraterculus*, *P. fuscipenne*, *P. pulchrum*, and *P. scabrum*. He did not see the type of *P. peletieri* Le Guillou, 1841 and did not recognize that this is the valid name for *P. ruficornis* F. Smith, 1856. Also, he did not notice a number of important characters, even those that can be observed with a simple hand lens (e.g., the presence of erect setae on tergum I).

Generally, very little progress in the taxonomy of the Australian *Pison* has been achieved in the last 100 years. An important exception was the discovery, by Evans (1981), of the species nesting in the soil and the correlation with the presence of the psammophores.

Prior to this study, our knowledge of the Australian species was quite insufficient for two main reasons: (1) a good number of excellent recognition characters had never been used for species characterizations, and (2) more than a hundred species were waiting to be discovered.

**SUBDIVISIONS OF AUSTRALIAN/NEW ZEALAND *PISON*.** — Menke (1988) divided the South American *Pison* into 12 species groups (two of which, the *convexifrons* group and the *pilosum* group, are now placed in *Entomopison*). I was unable, however, to produce a similar group recognition for the Australian species, mainly because of the absence of clear-cut divisions between species, as well as their great number and diversity. The following examples illustrate the difficulties that I have encountered:

(1) The subgenus *Pisonoides* was proposed for the species with only two submarginal cells, but the number of cells is variable in some species. For example, a male of *Pison marginatum* from Sunny Corner area, New South Wales (CAS) and a female of *Pison westwoodii* from Mount Lewis near Mossman, Queensland (CAS), have two submarginal cells in the left wing and three in the right wing. Furthermore, most specimens of *P. laeve* have three submarginal cells, but one male examined has only two. Similarly, most New Zealand specimens of *P. spinolae* have three submarginal cells, but many have only two (Harris, 1994). Clearly, the boundary between species with three submarginal cells and those with two is fluid.

(2) The subgenus *Pisonitus* was described to include the species in which the second recurrent vein is received near the middle of the second submarginal cell (rather than being interstitial with the second intersubmarginal vein or nearly so). The second recurrent vein, however, is received near two thirds of the length in *P. peletieri* from Papua New Guinea, and near two thirds to three quarters of the length in *P. leptogaster*, *P. orbitale*, and some *P. nigricans*. Therefore, these two separate types cannot be maintained.

(3) Based on its distinctly setose eyes, *Pison trichops* should be treated as a member of the *agile* species group of Menke. A closer analysis suggests, however, that the setose eyes may be an independent acquisition (see that species for details). *P. deplanatum*, in which the eyes are setose only above the eye emargination, seems to be halfway between the *agile* species group and the other *Pison*.

(4) The difference between those Australian *Pison* in which tergum I has erect setae and those in which the setae of tergum I are appressed seems well defined at first glance, but in fact the erect setae vary greatly among species in length and the area they cover. Also, in most *P. vestitum* the setae are erect on tergum I, but appressed in some specimens. Here again, the group difference is collapsing.

(5) Perhaps the most conspicuous are the species in which the females have a genal psammophore (used to carry the sand away during nest excavation). There is, however, significant variation among these species: most have also a well-defined forefemoral psammophore, but some lack it (*P. argentifrons*, *P. auriventris*, *P. stenometopon*). *Pison minutum*, however, is intermediate: its psammophore is unusually short (only 0.5-0.6 × midocellar diameter), present on the forefemur, but absent on the gena in some specimens.

**Key for Species Identification**

WARNING: A number of forms of uncertain status have not been included in this paper, and still unknown species are likely to exist. Determinations must therefore be carefully checked against diagnoses and descriptions of individual species.

Unknown and not included in the key are the females of the following species: *P. argyrotrichum*, *P. batavum*, *P. brevicorne*, *P. carinigerum*, *P. elatum*, *P. excisum*, *P. flexum*, *P. gracile*, *P. hirticeps*, *P. inusitatum*, *P. leonora*, *P. naralte*, *P. nigricans*, *P. parvum*, *P. pauper*, *P. petraeum*, *P. pilbara*, *P. pseudociliatum*, *P. pumilio*, *P. subtile*, and *P. terrigena*, and the males of: *P. abductor*, *P. adnyamathanha*, *P. austrinum*, *P. bicellulare*, *P. bimbi*, *P. breviclypeatum*, *P. clypeare*, *P. contiguum*, *P. deplanatum*, *P. ecarinatum*, *P. eurygnathos*, *P. fossor*, *P. frontale*, *P. globosum*, *P. gregorii*, *P. gymnopareion*, *P. hirsutum*, *P. illecebrosum*, *P. incurvatum*, *P. kalbarri*, *P. kurandae*, *P. laeviventer*, *P. laterirugosum*, *P. laticeps*, *P. melanocephalum*, *P. minutum*, *P. nubilipenne*, *P. nudigenale*, *P. occultans*, *P. oceanicum*, *P. oculare*, *P. pauper*, *P. pectinatum*, *P. radians*, *P. rarum*, *P. rotundum*, *P. rufotibiale*, *P. simplex*, *P. sinuosum*, *P. tenebrosum*, *P. tenuipunctatum*, *P. tomentosum*, *P. trichops*, *P. trilobatum*, and *P. woji*.

1. Forewings with two submarginal cells; head, thorax (excluding propodeum), femora, and tergum I with appressed setae ..... 2
  - At least one forewing with three submarginal cells, both wings with two submarginal cells in many *P. spinolae* in which head, thorax, propodeum, and tergum I have erect setae ..... 23
2. Scutal flange expanded, largely covering tegula (Fig. 561) ..... *laeve* F. Smith, p. 243 <sup>1</sup>
  - Scutal flange not expanded (usual shape) ..... 3
3. Tegula punctate throughout (punctures may be minute and difficult to see) except impunctate posterolaterally in some *P. aberrans* and some *P. quinquecarinatum* in which posterior margin of second submarginal cell is  $0.7\text{--}1.4 \times$  its height (as in Fig. 5) ..... 4
  - Tegula impunctate posterolaterally; posterior margin of second submarginal cell at least  $1.5 \times$  its height ..... 13
4. Gaster all ferruginous in most specimens, but partly or all black in some. Female: clypeal free margin nearly straight laterally; mandible bidentate apically. Male: clypeal free margin only slightly concave laterally, free margin of lamella roundly arcuate (Fig. 812) ..... *pertinax* Turner, p. 339
  - Gaster black (apical depressions of terga yellowish brown in *P. exclusum*). Clypeal free margin concave laterally in both sexes (slightly so in *P. bicellulare* and *P. tenebrosum*). Female: mandible simple apically. Male (known only in *P. aberrans*, *P. exclusum*, and *P. quinquecarinatum*): clypeal lamella different ..... 5
5. Eye setose (Fig. 1134) ..... *trichops* Pulawski, sp. nov., p. 466
  - Eye asetose or (in *P. deplanatum*) setose only above emargination ..... 6
6. Ocellocular distance  $1.8\text{--}1.9 \times$  hindocellar diameter; posterior margin of second submarginal cell  $1.9\text{--}2.2 \times$  its height; midtibial spur almost reaching apex of midbasitarsus, foretarsomere III shorter than wide (Fig. 395); apical depressions of terga I and III with conspicuous, golden setae, tergum II contrastingly without such setae; length  $8.3\text{--}8.6$  mm in female,  $7.2\text{--}8.8$  mm in male. Female: free margin of clypeal lamella tridentate (Fig. 392), apex of tergum VI rounded (Fig. 397) ..... *exclusum* Turner, p. 182
  - Ocellocular distance smaller than hindocellar diameter in female, at most  $1.2 \times$  hindocellar diameter in male; posterior margin of second submarginal cell at most  $1.7\text{--}1.8 \times$  its height

<sup>1</sup>This species is included twice in the key



- (*P. bicellulare*, *P. gracile*), markedly less in most species; midtibial spur reaching about half length of midbasitarsus, foretarsomere III as long as wide or longer; apical depressions of terga (including tergum II) at most with inconspicuous silvery setae; length no more than 5.5 mm. Female: free margin of clypeal lamella tridentate or not tridentate; apex of tergum VI acutely angulate . . . . . 7
7. Propodeum with two pairs of longitudinal carinae in addition to median carina: one extending from gastropodeal articulation toward spiracle, and one delimiting enclosure (Fig. 931) . . . . . *quinquecarinatum* Pulawski, sp. nov., p. 384
- Propodeum without carinae delimiting enclosure . . . . . 8
8. Postspiracular carina absent; mesopleuron evenly convex between pronotal lobe and episternal sulcus . . . . . 9
- Postspiracular carina present; mesopleuron depressed between postspiracular carina and episternal sulcus . . . . . 11
9. Propodeum without carina separating side from dorsum and posterior surface. Male: mandible bidentate apically (Fig. 473); sternum VIII unusually deeply emarginate (Fig. 476) . . . . . *gracile* Pulawski, sp. nov., p. 212
- Propodeum with carina separating side from dorsum and posterior surface; mandible unidentate apically . . . . . 10
10. Omalus present. Female: free margin of clypeal lamella evenly arcuate . . . . . *tenebrosus* Turner, p. 448
- Omalus absent. Female: free margin of clypeal lamella trilobate . . . . . *trilobatum* Pulawski, sp. nov., p. 473
11. Scutum without longitudinal ridges adjacent to posterior margin. Female: clypeal lamella not divided into basal and apical portions, without transverse carina, not bent posterad, its free margin with minute, median, obtuse point (Fig. 190) . . . . . *bicellulare* Pulawski, sp. nov., p. 108
- Scutum with short longitudinal ridges adjacent to posterior margin . . . . . 12
12. Female: clypeal lamella consisting of linear, transverse, impunctate dorsal portion that appears nearly truncate in frontal view (Fig. 535) and of ventral portion, distinctly separated from dorsal portion, forming distinct angle with it, and in most specimens conspicuously bent posterad and visible only in ventral oblique view (Fig. 536); border between two portions forming sharp, transverse carina . . . . . *incurvatum* Pulawski, sp. nov., p. 234
- Female: clypeal lamella undivided, placed in about the same plane as more dorsal portion . . . . . *aberrans* Turner, p. 37
13. Clypeal middle section not differentiated, free margin not concave laterally (almost evenly arcuate or minimally prominent mesally in female, obtusely angulate in male) . . . . . 14
- Clypeal middle section differentiated, free margin concave laterally . . . . . 16
14. Postocellar area with transverse sulcus adjacent to hindocelli (Fig. 302); eye above emargination with erect setae (Fig. 301); scutellum flat, situated in the same plane as scutum, its foremargin without foveate sulcus between axillae; propodeum without carina between dorsum and side; forefemur markedly thickened apically (Fig. 305). *deplanatum* Pulawski, sp. nov., p. 150
- Postocellar area without transverse sulcus adjacent to hindocelli; eye above emargination without erect setae; scutellum slightly convex, slightly raising above level of scutum, its foremargin with foveate sulcus between axillae (sulcus minimal in some specimens); propodeum between dorsum and side with carina that extends from gastral socket area toward spiracle; forefemur not thickened . . . . . 15
15. Punctures of upper frons averaging about one diameter apart; propodeal dorsum coarsely rugose posterolaterally; posterior propodeal surface coarsely ridged throughout; wing veins light

- brown to yellowish. Female: dorsal length of flagellomere I  $1.8 \times$  apical width. . . . . *clypeare* Pulawski, sp. nov., p. 125
- Punctures of upper frons less than one diameter apart; propodeal dorsum finely sculptured posterolaterally; posterior propodeal surface with fine ridges that become evanescent dorsally; wing veins dark brown. Female: dorsal length of flagellomere I  $1.5 \times$  apical width. . . . . *noctulum* Turner, p. 294
16. Tergum I elongate: length markedly greater than apical width (Figs. 312, 313, 514) . . . . . 17
- Tergum I sessile (apical width at most slightly greater than length) . . . . . 18
17. Punctures well separated on frons, scutum, mesopleuron, and propodeum; ocellocular distance about  $0.3 \times$  hindocellar diameter in female,  $0.5 \times$  in male; dorsal length of flagellomere III about  $2.6\text{--}3.2 \times$  apical width in female,  $2.4 \times$  in male; scutellum without foveate sulcus along anterior margin; anterior margin of second submarginal cell about  $0.5\text{--}0.9 \times$  length of first intersubmarginal vein; propodeum without longitudinal carina separating dorsum from side; setae of propodeal dorsum and posterior surface erect, not concealing integument; tergum I inconspicuously convex adjacent to apical depression . . . . . *difficile* Turner, p. 152
- Punctures contiguous on frons, scutum, mesopleuron, and propodeum; ocellocular distance  $1.3\text{--}1.7 \times$  hindocellar diameter in female; dorsal length of flagellomere III about  $1.5 \times$  apical width in female; scutellum with foveate sulcus along anterior margin; second submarginal cell shortly petiolate (Fig. 513) or its anterior margin about  $0.1\text{--}0.25 \times$  length of first intersubmarginal vein (Fig. 512); propodeum with ill-defined longitudinal carina separating dorsum from side; setae of propodeum fully appressed, totally concealing integument on posterior surface; tergum I conspicuously convex adjacent to apical depression (Fig. 515). . . . . *icarioides* Turner, p. 224
18. Sternum II coarsely punctate (Fig. 249); gaster all red. Female: gaster with conspicuous constriction between terga I and II, apical depression of tergum I markedly below more anterior part (Fig. 250); free margin of clypeal lamella without lateral corner (Fig. 246). Male: gaster more or less constricted between terga I and II, apical depression below more anterior part (Figs. 251, 252). . . . . *compressum* Pulawski, sp. nov., p. 128
- Sternum II finely punctate (punctures slightly larger in *P. simulans* in which gaster is black). Female: gaster barely constricted between terga I and II or constriction smaller, apical depression of tergum I only slightly below more anterior part (Fig. 373); free margin of clypeal lamella in some species with obtuse corner. Male: gaster not constricted to slightly constricted (in *P. simulans*) between terga I and II, apical depression almost at same level as more anterior part. . . . . 19
19. Clypeal lamella without median point and ocellocular distance smaller than hindocellar diameter and interocellar distance. . . . . 20
- Clypeal lamella with obtuse median point (Figs. 365, 373, 1021) and ocellocular distance in many specimens equal to or greater than interocellar distance . . . . . 21
20. All frontal setae evenly oriented dorsally, not forming patches; pronotal collar swollen, elongate dorsally (Fig. 197); postspiracular carina absent; scutum without longitudinal ridges adjacent to posterior margin; mesopleural vestiture not concealing integument; posteroventral forefemoral surface impunctate; wing membrane yellowish. . . . . *bimbi* Pulawski, sp. nov., p. 110
- Dorsally oriented setae on frons forming pair of patches below midocellus; pronotal collar not swollen, not elongate dorsally; postspiracular carina present; scutum with well defined longitudinal ridges adjacent to posterior margin; mesopleural vestiture concealing integument; forefemur densely punctate throughout; wing membrane hyaline . . . . . *prostratum* Pulawski, sp. nov., p. 352
21. Dorsum of pronotal collar elongate (Figs. 1023, 1024); femora all or largely black, forefemur



- somewhat swollen . . . . . *simulans* Turner, p. 421
- Dorsum of pronotal collar not elongate except elongate in some *P. erythrogastrum* in which forefemur is not swollen; at least hindfemur all ferruginous . . . . . 22
  - 22. Gaster black; forefemur impunctate posteroventrally (Fig. 365), narrowly so in male. Female: ocellocular distance  $1.0-1.2 \times$  hindocellar diameter. Male: apical sterna with erect setae about as long as  $0.3-0.4$  midocellar diameter; sternum VIII with apical margin convex mesally, concave submesally, and with apicolateral corner on each side (Fig. 367). . . . . *erythrocerum* Kohl, p. 172
  - Gaster either ferruginous (at least apically so) or all black; forefemur sparsely punctate or narrowly impunctate posteroventrally (Fig. 372). Female: ocellocular distance  $0.4-0.8 \times$  hindocellar diameter. Male: sterna with appressed setae; sternum VIII with apical margin rounded laterally (Fig. 374). . . . . *erythrogastrum* Rohwer, p. 175
  - 23. Second recurrent vein received near middle of second submarginal cell, near two thirds of length in *P. peletieri* from Papua New Guinea, near two thirds to three quarters of length in *P. leptogaster*, *P. orbitale*, and some *P. nigricans*. . . . . 24
  - Second recurrent vein interstitial with second intersubmarginal vein or nearly so, or received well on third submarginal cell, received near base of second submarginal cell in *P. spinolae* with two submarginal cells . . . . . 39
  - 24. Emargination of eye inner orbit unusually shallow, less than half as deep as midocellar diameter (Figs. 750, 756); mesopleuron with fine omalus . . . . . 25
  - Emargination of eye inner orbit usual size, as deep as midocellar diameter or more; mesopleuron without omalus. . . . . 26
  - 25. Clypeus with transverse, mesally interrupted swelling above lamella, its punctures separated by linear interspaces; free margin of lamella slightly concave on each side of midpoint and angulate laterally; ocellocular distance greater than hindocellar diameter; tegula punctate throughout, totally concealing humeral plate; mesopleuron with ill-defined hypersternaulus; hindtibia without spines; gaster all or partly ferruginous . . . . . *orbitale* Pulawski, sp. nov., p. 317
  - Clypeus without transverse swelling, with well-defined punctures, many of which are more than one diameter apart; free margin of lamella slightly, evenly arcuate, rounded laterally; ocellocular distance equal to hindocellar diameter; tegula partly impunctate, only partly concealing humeral plate; mesopleuron without hypersternaulus; hindtibia with minute spines on outer surface; gaster black. . . . . *oculare* Pulawski, sp. nov., p. 315
  - 26. Gaster pedunculate, length of tergum I markedly greater than apical width (Fig. 1201); distance between spiracles of tergum I smaller than distance between spiracle and gastropodopodeal articulation; ommatidia markedly larger in lower half of eye than those in dorsal half (Fig. 1199) . . . . . *woji* Menke, p. 498
  - Gaster not pedunculate, length of tergum I approximately equal to apical width; distance between spiracles of tergum I greater than distance between spiracle and gastropodopodeal articulation; ommatidia about equal size both dorsally and ventrally . . . . . 27
  - 27. Scutal punctures conspicuous (Fig. 588), some punctures up to two or three diameters apart; mesopleural punctures conspicuous, increasing in size toward venter, up to about two diameters apart ventrally (Fig. 589); second recurrent vein ending on submarginal cell II at two thirds to three quarters of latter's length (Fig. 590); gaster and legs black; length:  $9.5-10.8$  mm in female,  $7.2-8.5$  mm in male. Female: tergum VI elongate (Fig. 592). . . . .
  - . . . . . *leptogaster* Pulawski, sp. nov., p. 254
  - Scutal punctures markedly finer except in *P. nigricans* (whose male length is  $4.7-4.8$  mm), in many specimens less than one diameter apart; mesopleural punctures inconspicuous (except in *P. nigricans*), as large dorsally as ventrally; second recurrent vein received near middle of

- second submarginal cell in vast majority of specimens, toward two thirds of length in some. Gaster and/or legs in several species ferruginous; length varying. Female: tergum VI not elongate . . . . . 28
28. Distance between antennal socket and eye margin about twice socket diameter in female, greater than socket diameter in male. Female: free margin of clypeal lip obtusely tridentate (Fig. 1174). Male: free margin of clypeal lip roundly pointed mesally, concave on each side of midpoint (Fig. 1175); tegula with round gibbosity . . . . . *virosus* Turner, p. 484
- Distance between antennal socket and eye margin equal to or smaller than socket diameter except nearly twice socket diameter in *P. occultans*. Female: free margin of clypeal lip not tridentate. Male: free margin of clypeal lip in most specimens not roundly pointed, not concave on each side of midpoint, tegula without gibbosity . . . . . 29
29. At least gastral apex ferruginous, all gaster ferruginous in most specimens . . . . . 30
- Gaster all black . . . . . 33
30. Female: clypeal middle section not differentiated, free margin practically evenly arcuate orbit to orbit (Fig. 465); frons conspicuously swollen above antennal sockets (Figs. 466, 467), without middle supraantennal carina; posterior propodeal surface finely ridged, ridges in some specimens almost imperceptible . . . . . *frontale* Pulawski, sp. nov., p. 209
- Clypeus with well-defined median lobe (free margin markedly concave on each side of lobe); frons not swollen, with middle supraantennal carina; posterior propodeal surface with well-defined ridges, at least partly so . . . . . 31
31. Episcrobal area ridged or rugose (punctate between rugae), in many specimens also area beneath scrobal sulcus (Fig. 293), ridges or rugae varying from evanescent to conspicuous, partly hidden by vestiture; scutum in some specimens irregularly, transversely ridged . . . . . *deperditum* Turner, p. 146
- Mesopleuron evenly punctate, not hidden by vestiture; scutum punctate . . . . . 32
32. Punctures of scutum (Fig. 786) and sternum II minute, somewhat larger in specimens from Papua New Guinea. Female: free margin of clypeal lamella truncate or nearly so (Fig. 783). Male: free margin of clypeal lamella obtusely to acutely angulate (Fig. 784) or with median point. . . . . *peletieri* Le Guillou, p. 327
- Punctures of scutum and sternum II larger, easily recognizable (Fig. 950). Female: free margin of clypeal lamella roundly prominent (Fig. 948). Male: free margin of clypeal lamella roundly arcuate (Fig. 949) . . . . . *rufigaster* Pulawski, sp. nov., p. 391
33. Propodeal dorsum at most inconspicuously ridged. Female: distance between antennal socket and orbit about half socket diameter. . . . . 34
- Propodeal dorsum with well-defined ridges in most Australian specimens, ridges evanescent in some as well as in those from East Timor. Female: distance between antennal socket and orbit slightly less than socket diameter to larger than socket diameter. . . . . 35
34. Frons swollen above antennal base (Fig. 209); head subspherical in dorsal view (Fig. 209). Female: clypeal lamella only slightly protruding beyond free margin of lateral section (Fig. 210). Male unknown . . . . . *brevichypeatum* Pulawski, sp. nov., p. 115
- Frons not swollen above antennal base; head not subspherical in dorsal view (Fig. 1101). Female: clypeal lamella conspicuously protruding beyond free margin of lateral section (Fig. 1099); dorsal length of flagellomere I  $2.8 \times$  apical width; terga with golden setae; length 8.1-9.3 mm. Male: free margin of clypeal lamella slightly arcuate, almost straight (Fig. 1100); tergal setae silvery with golden tinge; length: 7.2 mm . . . . . *tenuisculptum* Pulawski, sp. nov., p. 452
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<sup>2</sup>This species is included twice in the key.



- setae of tergum I present on basal declivity. Female: clypeal lamella without transverse carina  
..... *setosum* Pulawski, sp. nov., p. 412
67. Thorax, propodeum, and gaster ferruginous (Fig. 643), only head black; head globose in dorsal view (Fig. 641); antennal socket almost reaching eye margin (Fig. 640); tegula punctate throughout; first recurrent vein joining first submarginal cell far away from first intersubmarginal vein (Fig. 642); second recurrent vein joining second submarginal cell before latter's midlength (Fig. 642); body length 5.2 mm ..... *melanocephalum* Turner, p. 277
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- . . . . . *simillimum* F. Smith, p. 415
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- . . . . . *antennatum* Pulawski, sp. nov., p. 57
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- Ocellocular distance  $1.3-1.7 \times$  hindocellar diameter; propodeum with longitudinal carina that separates side from dorsum and posterior surface, but in many specimens carina evanescent or completely replaced by series of short transverse ridges (ridges ill-defined in some specimens) ..... *xanthognathos* Pulawski, sp. nov., p. 500
- 149. Sternum III mesally with glabrous, transverse swelling slightly behind midlength, swelling in many specimens divided mesally (Figs. 1191, 1192) ..... 150
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- Setae of upper frons brown, up to  $0.7 \times$  as long as midocellar diameter just below midocellus; sternum II preapically with ill-defined, broadly interrupted mesally transverse swelling, its apical portion impunctate. New Zealand ..... *morosum* F. Smith, p. 283
- 151. Body all black; mesopleural punctures slightly more to markedly more than one diameter apart (Fig. 1190); ocellocular distance equal to  $0.3-0.6 \times$  hindocellar diameter; posterior propodeal surface all ridged; sterna punctate throughout; sternum VIII moderately emarginate apically (Fig. 1193) ..... *westwoodii* Shuckard (rare specimens), p. 487
- Without the above combination of characters. .... 152
- 152. Free margin of clypeal lamella obtusely angulate or rounded (e.g., Figs. 772, 1063, 1153), obtusely angulate to acutely angulate in *P. sulcatum* in which sternum VIII has broad longitudinal sulcus or round impression and rounded apical margin (Fig. 1077-1080); tergum VII without median carina or with median carina at the very apex ..... 153
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- Mandible simple apically, without abductor ridge or (*P. parvum*) with ill-defined abductor ridge; occipital carina not expanded; sternum VIII punctate and setose over large part of its surface ..... 156
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- Free margin of clypeal lamella without lateral corner (Fig. 772); setae of lower gena curved, sub-appressed, shorter than midocellar diameter; sternum II punctate throughout. .... *parvum* Pulawski, sp. nov., p. 323
- 157. Mandible bidentate apically (Fig. 284); tegula largely to all punctate (Fig. 286), punctures conspicuous; apicolateral corner of sternum VIII obtuse (Fig. 288) ..... *dentatum* Pulawski, sp. nov., p. 143

<sup>3</sup> The male of this species is included twice in the key.



- Mandible simple apically; tegula largely unsculptured, punctures minute; sternum VIII with apicolateral corner sharp . . . . . 158
- 158. Tibiae and tarsi ferruginous; flagellomeres III and IV concave basoventrally, expanded apicoventrally (Fig. 1066) . . . . . *subtile* Pulawski, sp. nov., p. 438
- Legs black; flagellomeres cylindrical . . . . . 159
- 159. Most of propodeal dorsum punctate, interspaces unsculptured, shiny (Fig. 653), posterior surface punctate in dorsal half; hypostomal carina not expanded, about as wide as occipital carina; setae of upper frons inconspicuous; apical margin of sternum VIII straight between apicolateral teeth (Fig. 654) . . . . . *modestum* Pulawski, sp. nov., p. 280
- Propodeal dorsum rugose, posterior surface all ridged; hypostomal carina expanded (about as wide as  $0.5 \times$  midocellar diameter), markedly wider than occipital carina; setae of upper frons conspicuous; apical margin of sternum VIII convex between apicolateral teeth (Fig. 504) . . . . . *hypostomale* Pulawski, sp. nov., p. 222
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- Mesopleural punctures only slightly larger than scutal punctures; scutal setae erect or suberect, about as long as midocellar diameter; hindfemur not incrassate apically; tergum I in most specimens with erect setae; mesopleural signum not expanded into longitudinal process . . . . . *vestitum* F. Smith, p. 480
- 162. Ventral surface of sternum VIII basally with glabrous, unsculptured swelling that extends as narrow midline to sternum's apical margin (Fig. 47), midline evanescent in some specimens; apical emargination approximately rectangular to obtusely angulate (Fig. 47) . . . . . *angulare* Pulawski, sp. nov., p. 51
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- 164. Setae of lower gena sinuous, as long as  $1.0\text{--}1.2 \times$  midocellar diameter; border between yellowish, apical portion of tergum VII and anterior black portion concave on each side of midpoint (Fig. 1128); side of tergum VII not concave; apical margin of sternum VIII slightly protruding mesally (Fig. 1129). . . . . *translucens* Pulawski, sp. nov., p. 462
- Setae of lower gena straight, shorter than midocellar diameter; border between yellowish, apical portion of tergum VII and anterior black portion nearly straight on each side of midpoint (Fig. 114); side of tergum VII slightly concave in most specimens; apical margin of sternum VIII narrowly emarginate (Fig. 115) . . . . . *aridum* Pulawski, sp. nov., p. 78
- 165. Sterna IV-VI each with well-defined, round, apicomedian impression (Fig. 532); sternum VIII with posterolateral corner acute, posterior margin mesally convex (Fig. 533), almost straight in some specimens . . . . . *impressiventre* Pulawski, sp. nov., p. 230
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- Scutal punctures on disk about 2-3 diameters apart; setae of lower gena straight or curved apically, about one midocellar diameter long; hypostomal carina not expanded, no more than

- 0.3 × as high as midocellar diameter; occipital carina not expanded, about as high dorsally as 0.2-0.3 × midocellar diameter . . . . . *formicarium* Pulawski, sp. nov., p. 200
176. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface . . . . . *nigricans* Pulawski, sp. nov., p. 289
- Propodeum without longitudinal carina separating side from dorsum and posterior surface . 77
177. Punctures of frons and scutum minute; scutal punctures about one diameter apart; sterna uniformly, finely, closely punctate . . . . . *angustivertex* Pulawski, sp. nov., p. 54
- Punctures of frons and scutum well defined; scutal punctures less than one diameter apart; sternum II with large punctures, impunctate apicomesally; sterna IV and V with a few sparse punctures (except punctures close to each other near lateral margin) . . . . .
- . . . . . *terrigena* Pulawski, sp. nov., p. 455
178. Flagellomeres III-VI slightly expanded ventrally (Fig. 1207), with glabrous tyloids that do not extend to flagellomere apex (Fig. 1208); mandible pale yellow in vast majority of specimens, all black in some; hypostomal carina somewhat expanded preapically in vast majority of specimens (Fig. 1206). . . . . *xanthognathos* Pulawski, sp. nov., p. 500
- Flagellomeres not expanded, without tyloids; mandible ferruginous mesally to black; hypostomal carina not expanded. . . . . 179
179. Dorsal length of flagellomere I 2.9-3.0 × apical width; metapleural punctures about equal in size to those of adjacent portion of propodeum; tibiae and tarsi ferruginous . . . . .
- . . . . . *novaecambriae* Pulawski, sp. nov., p. 300
- Dorsal length of flagellomere I 1.3-2.3 × apical width, but up to 2.5 × apical width in some *P. marginatum* in which metapleural punctures are markedly smaller than those of adjacent portion of propodeum; tibiae and tarsi ferruginous or black . . . . . 180
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- . . . . . *notochthonum* Pulawski, sp. nov., p. 297
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- Sterna III and IV with or without transverse, impunctate areas; sterna III-VII with or without erect setae; sternum VIII different: either lateral margin straight and not raised, or sculpture different, or apical margin different . . . . . 182
182. Propodeum at most with evanescent, short, longitudinal carina between dorsum and side, without transverse ridges on carina's inner side . . . . . 183
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183. Dorsal length of flagellomere I 1.3 × apical width; setae of lower gena appressed, shorter than midocellar diameter; propleuron densely punctate . . . . . *brevicorne* Pulawski, sp. nov., p. 116
- Dorsal length of flagellomere I 1.8-1.9 × apical width; setae of lower gena subappressed, longest ones slightly longer than midocellar diameter; propleuron with only a few sparse punctures ante-

<sup>4</sup> The male of this species is included twice in the key.



- riorly ..... *occidentale* Pulawski, sp. nov., p. 306
184. Scutum with at least some sparse erect or suberect setae whose length is more than half midocellar diameter ..... 185
- Scutal setae appressed, not longer than half midocellar diameter ..... 187
185. Sternum VIII without basal swelling; scutal punctures less than one diameter apart, interspaces microsculptured; sterna punctate and setose throughout; legs black ..... *ocellare* Pulawski, sp. nov., p. 312
- Sternum VIII in most specimens with unsculptured, basal swelling; in most specimens, at least a few scutal punctures more than one diameter apart, interspaces unsculptured to microsculptured; sterna III-VI, in many specimens, with unsculptured and asetose preapical areas in at least apical third; legs black to ferruginous ..... 186
186. Tibiae all or partly ferruginous; scutal punctures varying from less than one diameter apart to more than one diameter apart; gaster all black or gastral base all or partly ferruginous ..... *decipiens* F. Smith, p. 139
- Legs all black; scutal punctures averaging more than one diameter apart; gaster black ..... *scutatum* Pulawski, sp. nov., p. 402
187. Upper interocular distance slightly greater than lower interocular distance; setae of propodeal dorsum short, not extending beyond lateral carina; sterna III-VI with unsculptured and asetose preapical areas in at least apical third; sternum VII unsculptured mesally ..... *protrudens* Pulawski, sp. nov., p. 357
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188. Many scutal punctures more than one diameter apart; ocellocular distance  $1.7-2.2 \times$  hindocellar diameter; legs black (*P. areniferum*) or (*P. variipes*) only hindleg ferruginous. Australia ..... 189
- All scutal punctures less than one diameter apart or only some punctures at scutal center up to 2-3 diameters apart, but all scutal punctures more than one diameter apart in New Guinean specimens of *P. marginatum* in which ocellocular distance equals  $1.1-1.2 \times$  hindocellar diameter; leg color varying ..... 190
189. Setae of propodeal dorsum short, not extending beyond lateral carina; sterna II and III with punctures several diameters apart mesally; tergal punctures larger; punctures of sternum VIII conspicuous; legs black ..... *areniferum* Evans, p. 60
- Setae of propodeal dorsum longer, extending beyond lateral carina; sterna uniformly, densely punctate; tergal punctures finer; punctures of sternum VIII inconspicuous; hindfemur, hindtibia, and hindtarsus ferruginous ..... *variipes* Pulawski, sp. nov., p. 477
190. Propodeal dorsum punctate laterally; dorsal length of flagellomere I  $2.3-2.5 \times$  apical width; tibiae varying from black to ferruginous ..... *marginatum* F. Smith, p. 267
- Propodeal dorsum laterally with short transverse carinae emerging from longitudinal carina; dorsal length of flagellomere I  $1.7-2.3 \times$  apical width; legs black ..... 191
191. Propodeal dorsum glabrous along midline, glabrous area widening toward anterior margin where it is about  $2 \times$  as wide as midocellar diameter; apical emargination of sternum VIII with apical margin convex between apicolateral corners (Fig. 186) ..... *batavum* Pulawski, sp. nov., p. 106
- Propodeal dorsum narrowly glabrous along midline (glabrous area covered by inclined setae); margin of apical emargination of sternum VIII straight to concave between apicolateral corners (Fig. 174) ..... *barbatum* Evans, p. 99

192. Either sternum V or sternum VII with tuft of erect setae apicolaterally (Fig. 670, 796) . . . 193  
 – Sterna V and VII without tuft of erect setae . . . . . 194
193. Sternum VII with tuft of erect setae (Fig. 796), setal length equal to midocellar diameter; erect setae of upper frons about as long as midocellar diameter; scutum in most specimens with sparse, erect setae whose length is at least one midocellar diameter (and also with markedly shorter, dense, erect setae); setae of lower gena  $1.5-2.0 \times$  as long as midocellar diameter; sternum II along midline impunctate or with a few sparse punctures (except basally); sternum V without median sulcus; sternum VIII with obtuse longitudinal swelling (Figs. 797, 798) . . . . .  
 . . . . . *penicillatum* Pulawski, sp. nov., p. 332
- Sternum V with tuft of erect setae (Fig. 670), setal length  $1.8-2.0 \times$  midocellar diameter; upper frons with suberect setae whose length is about  $0.5 \times$  midocellar diameter; scutum without erect setae; setae of lower gena shorter than midocellar diameter; sternum II closely punctate (apical depression impunctate in some specimens); sternum V with well-defined sulcus on apical depression; sternum VIII without longitudinal swelling . . . *naralte* Pulawski, sp. nov., p. 286
194. Setae black on frons (except lateroventrally), thorax, propodeum, and femora; wings conspicuously infumate, almost black (Fig. 125); apical depressions of terga without silvery, setal fasciae (Fig. 126) . . . . . *aterrimum* Pulawski, sp. nov., p. 81
- Setae silvery on frons, thorax, propodeum, and femora; wings nearly hyaline; apical depressions of terga with silvery, setal fasciae . . . . . 195
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- Flagellomeres cylindrical or nearly so . . . . . 197
196. Gena at most sparsely punctate and setose on either side of oral fossa, practically glabrous in many specimens; at least flagellomere IV concave basoventrally (Fig. 158); sternum VIII without transverse preapical carina . . . . . *auriventre* Turner, p. 93
- Gena densely punctate and setose on either side of oral fossa; flagellomere IV not concave basoventrally (Fig. 63); sternum VIII with transverse carina preapically, area behind carina extremely finely punctate (Fig. 63) . . . . . *antennatum* Pulawski, sp. nov., p. 57
197. Sterna III and IV, on each side, with transverse, impunctate, slightly convex area (Fig. 767) at about midlength; posterior part of sterna III-VII with erect setae (setal length about one midocellar diameter); lateral margin of sternum VIII rounded, slightly raised over ventral surface, surface flat, all punctate except basally (punctures of two sizes, larger and smaller); apical margin slightly emarginate (practically not emarginate in some specimens), with apicolateral corner rounded . . . . . *ovale* Pulawski, sp. nov., p. 320
- Sterna III and IV with or without transverse, impunctate areas; sterna III-VII with or without erect setae; sternum VIII different: either lateral margin straight and not raised, or sculpture different, or apical margin different . . . . . 198
198. Scutal punctures contiguous, interspaces linear; propodeum at least with inconspicuous longitudinal carina separating side from dorsum and posterior surface; leg color varying from black to ferruginous; punctation of sterna varying . . . . . 199
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199. Ocellocular distance equal to  $1.7-1.8 \times$  hindocellar diameter; setae of lower gena curved, subappressed; most punctures of sterna II and III no more than one diameter apart, some punctures up to 1-2 diameters apart; legs ferruginous . . . . . *ciliatum* Evans, p. 122
- Ocellocular distance equal to  $0.9-1.2 \times$  hindocellar diameter; setae of lower gena sinuous, erect; punctures of sternum II apicomeresally and of sterna III and IV mesally several diameters apart;

- legs black or tibiae dark ferruginous . . . . . *psammophilos* Pulawski, sp. nov., p. 361
200. Propodeum without longitudinal carina separating side from dorsum and posterior surface . . . . . 201
- Propodeum with longitudinal carina separating side from dorsum and posterior surface . . . . . 203
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- Dorsal length of flagellomere I  $1.8-2.2 \times$  apical width. . . . . 202
202. Scutum with sparse, erect setae whose length is at least one midocellar diameter (also with markedly shorter, dense, erect setae); apical depression of sternum II closely punctate; sternum VIII not unusually broad (Fig. 581); body length 8.0-9.1 mm. . . . .
- . . . . . *leonorae* Pulawski, sp. nov., p. 252
- Scutal setae appressed; apical depression of sternum II impunctate; sternum VIII unusually broad (Fig. 549); body length 5.3-6.8 mm . . . . . *inuitatum* Pulawski, sp. nov., p. 238
203. At least terga I and II ferruginous; at least tibiae and tarsi ferruginous; tegula in most specimens completely punctate (except for narrow marginal rim). . . . .
- . . . . . *punctatum* Pulawski, sp. nov., p. 368
- Gaster black; tibiae black except ferruginous in *P. pseudociliatum* and many *P. pusillum*; tegula partly impunctate (most species) or all punctate. . . . . 204
204. Tegula all punctate (except for minute marginal rim); sterna V-VII with erect setae whose length is up to  $0.7 \times$  midocellar diameter. . . . . *stenometopon* Pulawski, sp. nov., p. 435
- Tegula partly impunctate and asetose in at least lateral half of width near midlength, except all punctate in *P. pumilio* in which setae of sterna V-VII are appressed . . . . . 205
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- . . . . . *curiosum* Pulawski, sp. nov., p. 136
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207. Dorsal length of flagellomere I  $1.3-1.5 \times$  apical width; setae of upper frons oriented ventrally; tegula larger, in many forewing positions fully covering humeral plate; mandible in many specimens yellowish mesally . . . . . *pusillum* Pulawski, sp. nov., p. 380
- Dorsal length of flagellomere I  $1.8-2.1 \times$  apical width; setae of upper frons oriented dorsally; tegula smaller, not covering humeral plate; mandible dark reddish mesally . . . . . 208
208. Setae nearly appressed on upper frons, appressed on scutum; setae of lower gena up to about  $1.0 \times$  as long as midocellar diameter. . . . . *setiferum* Pulawski, sp. nov., p. 409
- Upper frons with at least sparse erect setae; scutum with at least a few erect setae; setae of lower gena up to about  $2.0 \times$  as long as midocellar diameter . . . . . 209
209. Hypostomal carina enlarged, about as high as  $0.5 \times$  midocellar diameter; punctures of scutal disk averaging 2-3 diameters apart . . . . . *pilbara* Pulawski, sp. nov., p. 345
- Hypostomal carina not enlarged, about as high as  $0.2 \times$  midocellar diameter; punctures of scutal disk varying from less than one diameter apart to more than one diameter apart . . . . .
- . . . . . *hirticeps* Pulawski, sp. nov., p. 219
210. Free margin of clypeal lamella concave on each side of midpoint (Fig. 341); sternum VIII with elongate, elevated platform mesally (Figs. 342, 343) . . . . . *elatum* Pulawski, sp. nov., p. 164
- Free margin of clypeal lamella straight on each side of midpoint; sternum VIII without elongate, elevated platform. . . . . 211
211. Tibiae and tarsi ferruginous; upper interocular distance equal to  $1.00 \times$  lower interocular



- distance; ocellocular distance equal to  $2.3 \times$  hindocellar diameter; sterna III-VI unsculptured and shiny preapically. . . . . *pseudociliatum* Pulawski, sp. nov., p. 364
- Legs black or tarsi dark ferruginous; upper interocular distance equal to  $0.74-0.90 \times$  lower interocular distance; ocellocular distance equal to  $0.8-1.16 \times$  hindocellar diameter; sterna III-VI punctate throughout. . . . . 212
212. Clypeal lamella acutely to slightly obtusely angulate (Fig. 91); tegula unsculptured posteriorolaterally; sternum VIII convex subbasally (Fig. 95); apical depressions of terga II-VI ferruginous . . . . . *argentifrons* Pulawski, sp. nov., p. 72
- Clypeal lamella acutely angulate (Fig. 886); tegula all finely punctate (except narrowly impunctate near apex); sternum VIII flat or concave; apical depressions of terga II-VI dark brown, almost black . . . . . *pumilio* Pulawski, sp. nov., p. 366

## SPECIES DESCRIPTIONS

(Species are arranged alphabetically.)

*Pison abductor* Pulawski, species nova

Figures 1-4.

**NAME DERIVATION.**— *Abductor*, a noun in apposition, with reference to the well developed abductor ridge of this species.

**RECOGNITION.**— *Pison abductor* can be recognized by the erect setae of tergum I combined with a well-defined abductor ridge. A subsidiary recognition feature is the sculpture of tergum I: the anterior declivity is covered with dense, microscopic punctures and markedly larger punctures several to many diameters apart.

**DESCRIPTION.**— Frons dull, finely punctate, punctures nearly contiguous. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 2). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, interspaces linear, unsculptured. Tegula enlarged. Mesopleural punctures well defined, contiguous. Postspiracular carina present, slightly shorter than midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, with middle carina in shallow sulcus; side ridged, punctate between ridges; posterior surface conspicuously, transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate, inner carina produced into medium size tooth basally. Inclined part of tergum I with dense, minute punctures and with much larger, much sparser punctures (several to many diameters apart); punctures of horizontal part about one diameter apart. Punctures of sternum II mesally conspicuous, many diameters apart apicomesally, of sterna III and IV 2-3 diameters apart along midline.

Setae silvery, both appressed and erect on upper frons, erect on postocellar area, scutum, and tergum I; on lower gena sinuous,  $2 \times$  as long as midocellar diameter; largely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible with dark reddish area at about apical two thirds.

♀.— Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 1). Dorsal length of flagellomere I  $3.8 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength; outer surface



FIGURES 1-3. *Pison abductor* Pulawski, sp. nov., female. (1) Clypeus and mandibles; (2) Head in dorsal view; (3) Mandible in lateral view (arrow shows abductor ridge).

FIGURE 4. Collecting locality of *Pison abductor* Pulawski, sp. nov.

with well-developed abductor ridge (Fig. 3). Tergum VI with median carina, carina about as long as midocellar diameter. Length 8.1 mm; head width 2.7 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 4).—Known from one locality in the Kakadu National Park, Northern Territory.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Northern Territory: Nourlangie Rock, now Burrungui, in Kakadu National Park, 18 Oct 1972, E.F. Riek (ANIC).

### *Pison aberrans* Turner

Figures 5-12.

*Pison aberrans* Turner, 1908:519, ♂. Lectotype: ♂, Australia: Queensland: Mackay (BMNH), present designation, examined. — Turner, 1908:458 (figure of forewing), 1916b:596 (in key to Australian *Pison*), 601 (diagnostic characters); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:257 (in catalog of Australian Sphecidae).

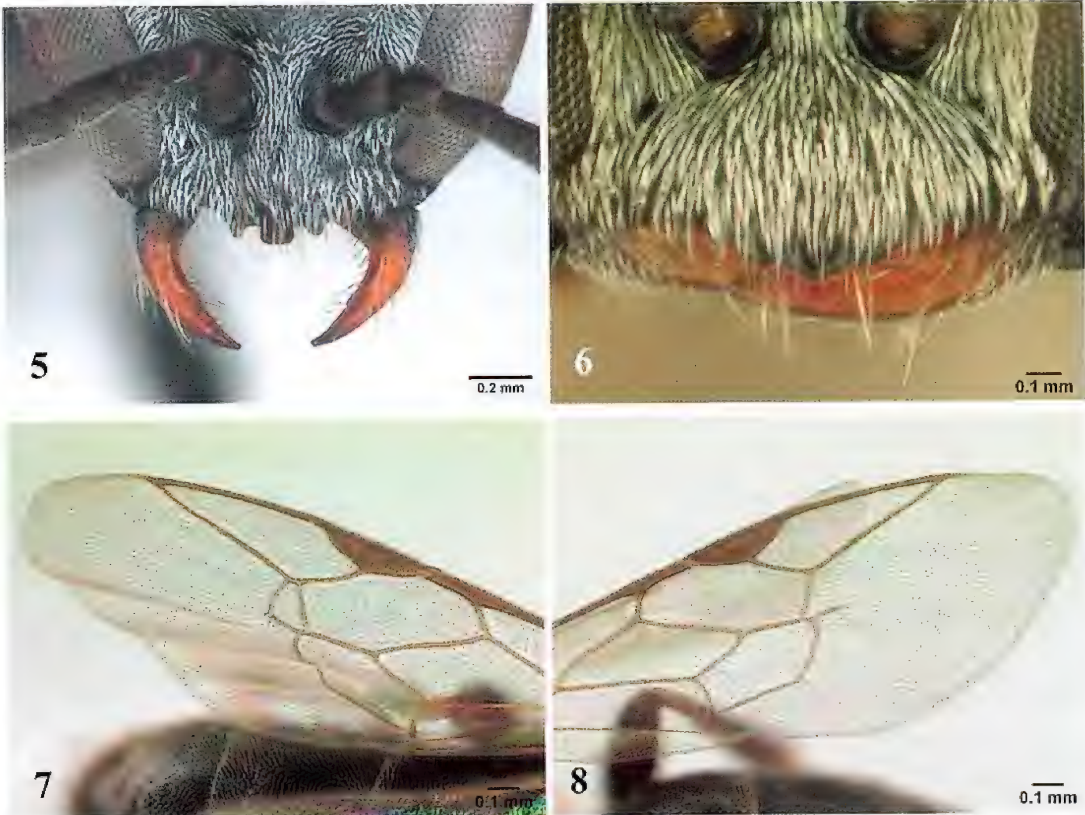
**LECTOTYPE DESIGNATION.** — Turner (1908) did not mention the number of specimens upon which he based his description of *Pison aberrans*. I have selected as the lectotype the only specimen present in The Natural History, London, that bears the label "*Pison aberrans* Turner, Type" in Turner's handwriting.

**RECOGNITION.**—*Pison aberrans* is a small species (length 3.5-4.2. mm), with only two sub-



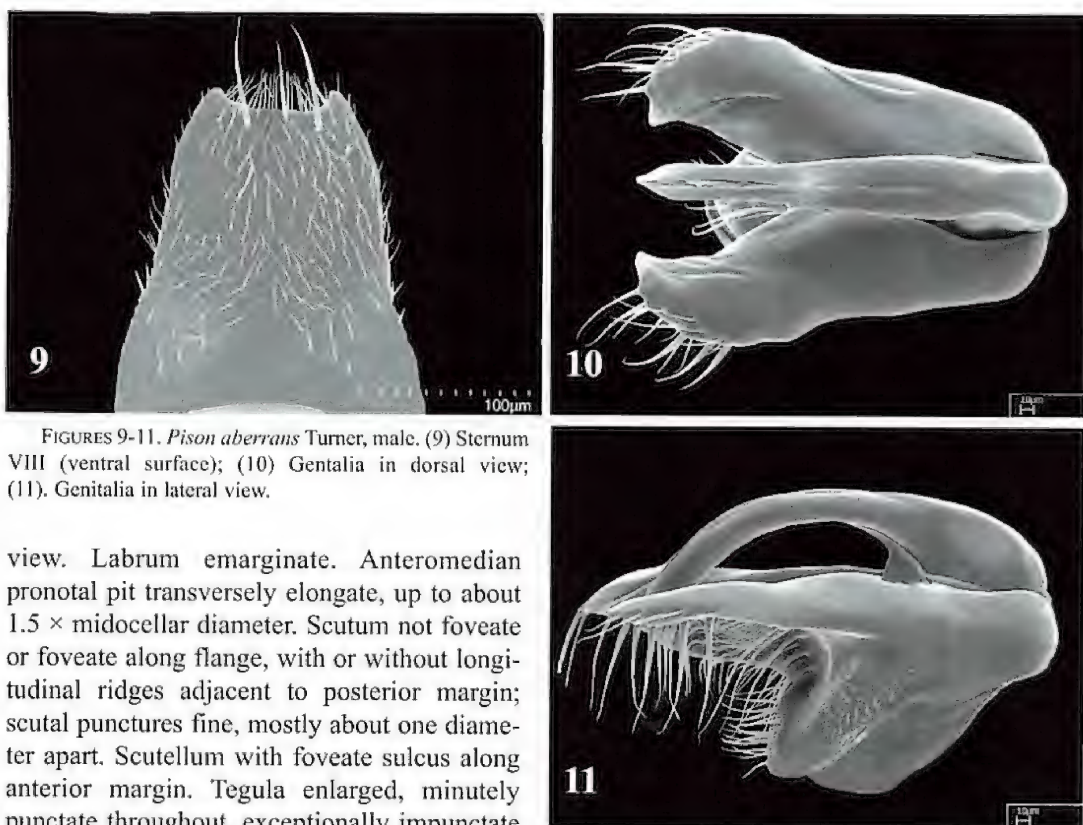
marginal cells (exceptionally one), the posterior margin of the second one being equal to  $0.7-1.4 \times$  its height. It is further characterized by the head, thorax, gaster, and femora all black, the head in many specimens subspherical in the dorsal view, the clypeus with a prominent lobe mesally, the ocellocular distance smaller than the distance between the hindocelli, the tegula completely covering the humeral plate or nearly so, the presence, on the propodeum, of a longitudinal carina separating the side from the dorsum and the posterior surface and extending from the gastral socket area toward the spiracle, and the tibiae all or predominantly black. It differs from similar species in having asetose eyes, the tegula minutely punctate throughout or exceptionally impunctate and asetose posterolaterally, the mesopleuron without an omalus, the integument depreseed between the postspiracular carina and the episternal sulcus, and the propodeal dorsum coarsely ridged or rugose, at least near the median sulcus (rather than finely microareolate or finely regularly ridged). The yellowish brown tarsi of many males are subsidiary recognition features, as is male sternum VIII with two apical setae that protrude beyond the sternum apical margin. Unlike *P. incurvatum* (whose male is unknown), the clypeal lamella is in about the same plane as the more dorsal portion (rather than bent posteriorly, forming an angle with the more dorsal part), and the dorsal length of flagellomere I  $1.3-1.6 \times$  its apical width in the female,  $1.0-1.4 \times$  in the male (rather than  $2.1 \times$  in the female).

**DESCRIPTION.**— Head in many specimens subspherical in dorsal view. Frons dull, minutely punctate, punctures less than one diameter apart, middle supraantennal carina absent or evanescent. Distance between antennal socket and orbit about equal to socket width. Gena narrow in dorsal



FIGURES 5-8. *Pison aberrans* Turner. (5) Female clypeus; (6) Male clypeus; (7) Left wing of holotype; (8) Right wing of holotype.





FIGURES 9-11. *Pison aberrans* Turner, male. (9) Sternum VIII (ventral surface); (10) Genitalia in dorsal view; (11). Genitalia in lateral view.

view. Labrum emarginate. Anteromedian pronotal pit transversely elongate, up to about  $1.5 \times$  midocellar diameter. Scutum not foveate or foveate along flange, with or without longitudinal ridges adjacent to posterior margin; scutal punctures fine, mostly about one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged, minutely punctate throughout, exceptionally impunctate and asetose posterolaterally (as in holotype), fully concealing humeral plate or nearly so. Mesopleuron finely punctate, punctures averaging about one diameter apart; postspiracular carina present, integument depressed between postspiracular carina and episternal sulcus. Postspiracular carina present, about half as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges fine to conspicuous) or rugose, punctate between ridges; side punctate, interspaces merging into ridges; posterior surface ridged. Forewing with two submarginal cells (Fig. 7), second submarginal cell absent in the right wing of holotype (Fig. 8); posterior margin of second submarginal cell about  $0.7\text{--}1.4 \times$  its height. Punctures of tergum I on horizontal portion in most specimens less than one diameter apart, but more than one diameter apart in some. Sterna punctate throughout.

Setae silvery, appressed on head, thorax, forecoxal venter, femoral venters, and tergum I; frontal setae oriented dorsally (oriented ventrally adjacent to eye margin). Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, mandible yellowish reddish except black basally and dark apically; antenna all black or flagellum ferruginous ventrally. Legs all black in most females and some males, but fore- and midtibiae, base of hindtibia, and tarsi yellowish brown in some females; tarsi (all or most) yellowish brown in most males; mid- and hindtibial spurs whitish in most specimens, but brown in some.

♀.—Upper interocular distance equal to  $1.06\text{--}1.10 \times$  lower interocular distance; ocellocular distance equal to  $0.5\text{--}1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5\text{--}1.8 \times$

hindocellar diameter; eye height equal to  $0.92-1.04 \times$  distance between eye notches. Free margin of clypeal lamella varying from arcuate to obtusely tridentate, with lateral teeth either well defined (as in Fig. 5) or inconspicuous, in many specimens separated by transverse carina from remaining clypeal surface. Dorsal length of flagellomere I  $1.3-1.6 \times$  apical width, of flagellomere IX  $0.7 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Length 3.5-4.2 mm; head width 1.0-1.1 mm

♂.—Upper interocular distance equal to  $0.90-1.00 \times$  lower interocular distance; ocellular distance equal to  $0.6-1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.7 \times$  hindocellar diameter; eye height equal to  $0.78-1.02 \times$  distance between eye notches. Free margin of clypeal lamella arcuate to obtusely tridentate (Fig. 6), middle tooth widest, markedly larger than lateral tooth in some specimens. Dorsal length of flagellomere I  $1.0-1.4 \times$  apical width, of flagellomere X  $0.7-0.8 \times$ . Sternum VIII broadly emarginate (Fig. 9), with pair of apical setae that are up to about  $1.5 \times$  as long as midocellar diameter and protrude beyond sternal margin. Genitalia: Figs. 10 and 11. Length 3.8-5.0 mm; head width 1.0-1.3 mm.

#### GEOGRAPHIC DISTRIBUTION (Fig. 12).—

New South Wales, Northern Territory, Queensland, South Australia, Western Australia, also Papua New Guinea.



FIGURES 12. Collecting localities of *Pison aberrans* Turner

#### RECORDS.— AUSTRALIA: Australian Capital Territory:

Black Mountain (2 ♀, ANIC), Canberra (2 ♀, ANIC), Farrer, southern suburb of Canberra at  $35^{\circ}22'S$   $149^{\circ}05'E$  (4 ♀, ANIC; 1 ♂, CAS).

**New South Wales:** Gilgandra (1 ♀, AMS), Ku-Ring-Gai Chase National Park (1 ♂, ANIC), Lorian Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (1 ♀, AMS), 15 km SE Moree (1 ♀, QMB), Mount Tomah (4 ♀, AMS), 16 km N Mudgee (1 ♀, ANIC), 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$  (1 ♀, CAS), 23 km SE Tamworth (3 ♀, 1 ♂, ANIC; 1 ♂, CAS), Warrumbungle National

Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (2 ♀, 1 ♂, CAS) and at  $31^{\circ}16'S$   $148^{\circ}57'E$  (1 ♀, MNKB), near Warrumbungle National Park at  $31^{\circ}16.9'S$   $149^{\circ}04.8'E$  (1 ♀, CAS). **Northern Territory:** Gregory National Park at  $16^{\circ}06.6'S$   $130^{\circ}25.7'E$  (2 ♀, ANIC; 2 ♀, CAS), at  $16^{\circ}06.7'S$   $130^{\circ}25.4'E$  (1 ♀, CAS), at  $16^{\circ}06'42''E$  (1 ♀, ANIC), and at  $16^{\circ}12'47''S$   $130^{\circ}25'11''E$  (1 ♀, CAS), Nourlangie Rock (now Burrungui) in Kakadu National Park at  $12^{\circ}51'S$   $132^{\circ}48'E$  (1 ♂, ANIC), Victoria Highway at  $15^{\circ}42'40''S$   $130^{\circ}07'48''E$  (1 ♀, CAS) and at  $15^{\circ}56'11''S$   $129^{\circ}35'22''E$  (2 ♀, ANIC). **Queensland:** 11 km NW Bald Hill in Mellwraigt Range at  $13^{\circ}44'S$   $143^{\circ}20'E$  (1 ♀, ANIC), Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$  (1 ♀, ANIC) and at  $12^{\circ}41'S$   $142^{\circ}41'E$  (1 ♀, ANIC), 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$  (9 ♀, ANIC), 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$  (3 ♀, ANIC), Bull Creek at  $15^{\circ}18'S$   $144^{\circ}49'E$  (1 ♀, ANIC), Cania Gorge National Park at  $24^{\circ}43'S$   $150^{\circ}59'E$  (1 ♀, ANIC), Cockatoo Creek crossing 17 km NW Heathlands at  $11^{\circ}39'S$   $142^{\circ}27'E$  (5 ♀, ANIC), Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$  (8 ♀, ANIC), Forty Mile Scrub National Park (1 ♀, AMS), George Creek Station 27.5 km W Black Braes Homestead at  $19^{\circ}32'53''S$   $143^{\circ}56'33''E$  (1 ♀, AMS), George Creek Station at  $19^{\circ}32'53''S$   $143^{\circ}56'33''E$  (1 ♀, AMS), Hann River at  $15^{\circ}11'S$   $143^{\circ}52'E$  (2 ♀, 1 ♂, ANIC), Heathlands at  $11^{\circ}45'S$   $142^{\circ}35'E$  (15 ♀, 2 ♂, ANIC; 2 ♀, CAS), Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$  (4 ♀, CAS), 14 km NW Hope Vale Mission at  $15^{\circ}16'S$   $144^{\circ}59'E$  (1 ♀, ANIC), Lawn Hill National Park at  $18^{\circ}40'15''S$   $138^{\circ}22'15''E$  (1 ♀, QMB), Lawn Hill National Park: Murrays Spring at  $18^{\circ}35'15''S$   $138^{\circ}04'28''E$  (2 ♀, ANIC; 2 ♀, QMB), Mackay (1 ♂, BMNH, lectotype of *Pison aberrans*), near Mareeba (1 ♂, CAS), Moreton Homestead at  $12^{\circ}27'S$   $142^{\circ}38'E$  (1 ♀, ANIC), 48 km E Mount Surprise at  $18^{\circ}09.0'S$   $144^{\circ}43.6'E$  (4 ♀, CAS), Musselbrook Camp at  $18^{\circ}36'S$   $138^{\circ}08'E$  (2 ♀, ANIC), Ridgepole Waterhole at  $18^{\circ}40'15''S$   $138^{\circ}22'15''E$  (1 ♂, ANIC), 2 km N Rokeby at  $13^{\circ}39'S$   $142^{\circ}40'E$  (3 ♀, ANIC), Split Rock 14 km SE Laura at  $15^{\circ}39'S$   $144^{\circ}31'E$  (6 ♀, 1 ♂, ANIC).



6 km N Taroom at 25°36'S 149°46'E (1 ♀, QMB), 13 km SE Weipa at 12°40'S 143°00'E (5 ♀, 1 ♂, ANIC). **South Australia:** Adelaide: Waite Research Institute (1 ♀, QMB), Trezona Camp at Brachina Creek at 31°20'S 138°37'E (2 ♂, ANIC), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (13 ♀, 1 ♂, CAS), 3 km ENE Wilpena in Flinders Ranges National Park at 31°31.0'S 138°36.6'E (3 ♀, CAS). **Western Australia:** 12 km S Kalumburu Mission at 14°25'S 126°38'E (1 ♀, ANIC), Kennedy Range National Park at 24°38.7'S 115°10.7'E (2 ♀, 1 ♂, ANIC; 1 ♀, CAS), crossing of Lennard River and Gibb River road at 17°23'S 124°44'E (1 ♀, WAM), Lone Dingo in Mitchell Plateau at 14°35'S 125°45'E (1 ♀, ANIC), Mining Camp in Mitchell Plateau at 14°49'S 125°50'E (1 ♀, ANIC), Mitchell Plateau at 14°52'S 125°50'E (16 ♀, 1 ♂, ANIC; 2 ♀, CAS).

**PAPUA NEW GUINEA: National Capital District:** Boroko – a southern suburb of Port Moresby (1 ♂, BISH).

***Pison acutum* Pulawski, species nova**

Figures 13-25.

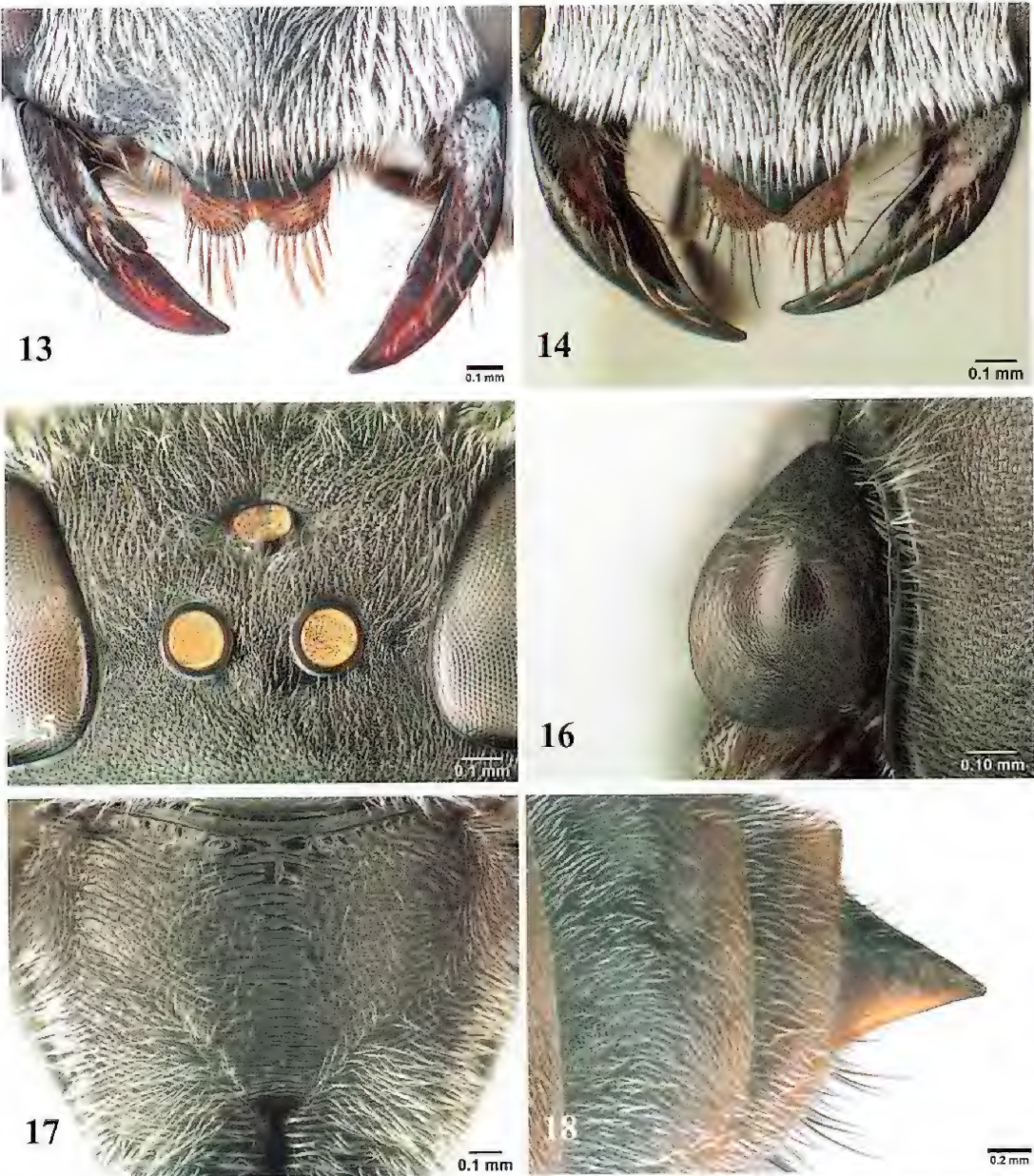
**NAME DERIVATION.**— *Acutum*, Latin neuter adjective meaning *sharp*; with reference to the sharp median carina on the apical tergum.

**RECOGNITION.**— *Pison acutum* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, the tegula partly impunctate and asetose, and setae appressed on tergum I. Both sexes have a median carina on the apical third of the apical tergum (Figs. 18 and 19), and punctures of sternum II are several diameters apart mesally. The female clypeus is unique: the free margin of the lamella is broadly, roundly arcuate, and the lateral, convex portion of the free margin is relatively long, attaining the lamella (Fig. 13); in other species, the lateral, convex part of the free margin is separated by a concave part from the lamella. The male, in addition to the median carina of tergum VI, has erect setae on sterna II-VIII that become gradually longer toward gastral apex, as long as the midocellar diameter on sternum VII (Fig. 20). A subsidiary recognition feature is the mesopleural punctation: the punctures are well defined and in most specimens average more than one diameter apart at the center. The presence of a longitudinal carina on the apical tergum is shared with the female of *Pison nitens*, in which the propodeal dorsum is minutely, sparsely punctate whereas all ridged in *acutum*.

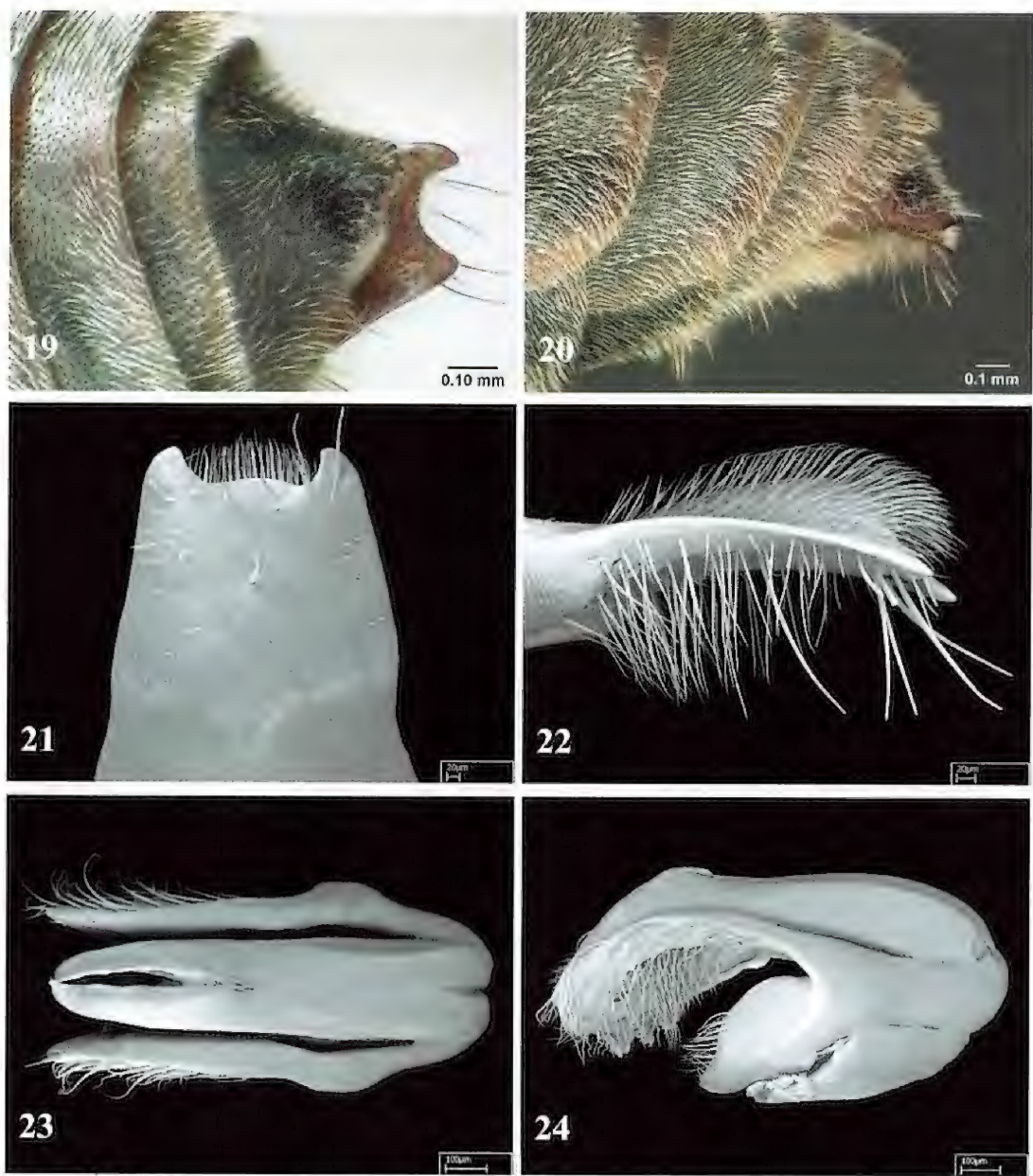
**DESCRIPTION.**— Frons dull, conspicuously microsculptured, minutely punctate, punctures inconspicuous, less than one diameter apart. Gena narrow in dorsal view. Labrum emarginate mesally, inconspicuously so in male. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, at most with evanescent, short longitudinal ridges adjacent to posterior margin; scutal punctures fine, about one diameter apart on disk; interspaces microsculptured. Tegula slightly enlarged, its free margin broadly rounded posteriorly (Fig. 16). Mesopleural punctures well defined, averaging more than one diameter apart at center in most specimens, but less than one diameter apart in some; interspaces microsculptured. Postspiracular carina present, 1.0-1.5 × as long as midocellar diameter. Metapleural sulcus costulate or not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with or without middle carina, obliquely or transversely ridged, with inconspicuous punctures between ridges (Fig. 17); side ridged, punctate between ridges; posterior surface ridged. Posteroventral forefemoral surface finely punctate, punctures up to several diameters apart. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I several diameters apart on horizontal part. Apical tergum with median carina in apical third, measured from tergum's anterior margin (Figs. 18, 19). Sternum II with punctures several diameters apart mesally.

Setae silvery, appressed on scutum, femoral venters, and tergum I, oriented ventrad between





FIGURES 13-18. *Pison acutum* Pulawski, sp. nov. (13) Female clypeus and mandibles; (14) Male clypeus and mandibles; (15) Female vertex; (16) Female tegula and adjacent scutum; (17). Propodeal dorsum of female; (18) Female apical terga.



FIGURES 19-24, *Pison acutum* Pulawski, sp. nov. (19) Gastral apex of male; (20) Apical sterna of male in profile; male. (21) Sternum VIII (ventral surface); (22) Sternum VIII in lateral view; (23) Genitalia in dorsal view; (24) Genitalia in lateral view.



dorsal end of middle carina and midocellus, completely concealing integument on clypeus except lamella; setae of lower gena curved, about as long as one midocellar diameter. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.74 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter (Fig. 15); eye height equal to  $1.00\text{--}1.02 \times$  distance between eye notches. Free margin of clypeal lamella broadly, roundly arcuate; lateral, convex portion of free margin relatively long, attaining lamella (Fig. 13). Dorsal length of flagellomere I  $2.5\text{--}2.6 \times$  apical width, of flagellomere IX  $1.3\text{--}1.5 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 8.5–9.0 mm; head width 2.5–2.7 mm.

♂.—Upper interocular distance equal to  $0.76\text{--}82 \times$  lower interocular distance; ocellocular distance equal to  $1.3\text{--}1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.98\text{--}1.0 \times$  distance between eye notches. Free margin of clypeal lamella acutely to slightly obtusely angulate, nearly rectangular (Fig. 14). Dorsal length of flagellomere I  $2.5\text{--}2.6 \times$  apical width, of flagellomere X  $1.3\text{--}1.4 \times$  apical width. Sterna II–VIII with erect setae becoming gradually longer toward gastral apex, as long as midocellar diameter on sternum VII (Fig. 20). Sternum VIII impunctate apicomeresally, broadly emarginate apically, apicolateral arm sharp (Figs. 21, 22). Genitalia: Figs. 23, 24. Length 6.8–8.3 mm; head width 2.1–2.5 mm.

#### GEOGRAPHIC DISTRIBUTION (Fig. 25).—

New South Wales, South Australia, Queensland.

RECORDS.—HOLOTYPE: ♂, AUSTRALIA: **South Australia**: 3 km ENE Wilpena in Flinders Ranges National Park at  $31^{\circ}31.0'E$   $138^{\circ}36.6'E$ , 26 Jan 2011, V. Ahrens and W.J. Pulawski (SAM).

PARATYPES: AUSTRALIA: **New South Wales**: Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , 29 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$ , 12 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 16 km N Mudgee, 3–4 Oct 1982, D.S. Horning (1 ♂, ANIC); 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$ , V. Ahrens and W.J. Pulawski, 3 Jan 2012 (1 ♀, 1 ♂, CAS) and 5 Jan 2012 (1 ♀, CAS). **Queensland**: Ban-Ban Range via Coalstoun Lakes, Jan 1974, H. Frauca (1 ♀, ANIC); 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$ , 23 Aug – 16 Sept, P. Zborowski and L. Miller (1 ♂, ANIC); Brisbane: Karawatha Forest at  $27^{\circ}38.6'S$   $153^{\circ}04.2'E$ , 12 Dec 2006, W.J. Pulawski (1 ♂, CAS); 12 km W Fairview via Laura, 26 June 1975, S.R. Monteith (1 ♂, ANIC); Granite Gorge ca 6 km SW Mareeba, 19 Jan – 1 Feb 1999, M. Generani and P.L. Scaramozzino (1 ♂, CAS); 13 km SE Weipa at  $12^{\circ}40'S$   $143^{\circ}00'E$ , 15 Nov – 16 Dec 1993, P. Zborowski (1 ♀, ANIC). **South Australia**: same place and collectors as holotype, 26 Jan 2011 (1 ♀, CAS), 27 Jan 2011 (2 ♀, 2 ♂, CAS); Aroona Ruins in Flinders Ranges National Park at  $31^{\circ}17'S$   $138^{\circ}35'E$ , 9 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♀, CAS); Sheoak Hill Conservation Reserve 38 km NNW Coville at  $33^{\circ}22.6'S$   $136^{\circ}47.4'E$ , 29 Dec 2010, V. Ahrens and W.J. Pulawski (2 ♀, CAS), Trezona Camp at Brachina Creek at  $31^{\circ}20'S$   $138^{\circ}37'E$ , 10 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♀, ANIC).



Figure 25. Collecting localities of *Pison acutum* Pulawski, sp. nov.



*Pison adnyamathanha* Pulawski, species nova

Figures 26-29.

**NAME DERIVATION.**—*Adnyamathanha*, meaning *rock people*, is the name of the aboriginal tribe inhabiting the Flinders Ranges, an area where the holotype was collected.

**RECOGNITION.**—*Pison adnyamathanha* has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, the propodeum with an irregular longitudinal carina separating the side from the dorsum and the posterior surface and extending from the gastral socket area toward spiracle, and the setae appressed on tergum I, the gaster black (apical depressions of terga yellowish brown), and at least the hindfemur, tibiae, and tarsi ferruginous. It is further characterized by the setae of the lower gena straight, shorter than the midocellar diameter (but partly sinuous in the single female from Wilpena, South Australia), the frons setae silvery, and sterna densely punctate throughout. The female (the male is unknown) lacks specializations found in other species: the clypeus is evenly convex above the lamella, the lamella is prominently rounded, there are no psammophores on the gena and foreleg, and the tegula is not particularly elongate. It can be recognized by the following combination: ocellocular distance equal to  $1.2-1.5 \times$  hindocellar diameter, trimmal mandibular carina with rounded preapical tooth, scutal punctures less than one diameter apart, and tergum VI moderately broad (Fig. 28); the clypeal lamella is protruding less than in *P. protrudens* (compare Figs. 26 and 861), and the setae of the propodeal dorsum extend beyond the lateral carina (they do not extend in *protrudens*).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, less than one diameter apart. Tegula somewhat enlarged. Mesopleural punctures nearly compressed. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (punctures less than one diameter apart), with short, oblique ridges on each side of median sulcus; side punctate (punctures less than one diameter apart, interspaces merging into fine ridges; posterior surface transversely ridged. Posteroventral forefemoral surface finely, closely punctate. Hindcoxal dorsum with outer margin obtusely carinate in anterior half. Punctures of tergum I less than one diameter apart on horizontal portion. Sterna punctate throughout.

Setae silvery, on scutum sparse and erect (about as long as  $0.5 \times$  midocellar diameter), appressed on tergum I, suberect to subappressed on lower gena and shorter than midocellar diameter (partly sinuous and about as long as midocellar diameter in single female from Wilpena, South Australia), oriented ventrally on frons; not concealing integument on clypeus. Apical depressions of terga with setal fasciae, fasciae silvery or with golden tinge.

Head, thorax, propodeum, and gaster black, mandible ferruginous mesally; apical depressions of terga yellowish brown. Forefemur varying from all black to all ferruginous, midfemur largely black to all ferruginous, hindfemur ferruginous; tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.84-0.96 \times$  lower interocular distance; ocellocular distance equal to  $1.1-1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.5 \times$  hindocellar diameter (Fig. 27); eye height equal to  $0.96-0.98 \times$  distance between eye notches. Free margin of clypeal lamella prominently rounded (Fig. 26). Dorsal length of flagellomere I  $1.8-2.1 \times$  apical width, of flagellomere IX  $1.0 \times$  apical width. Mandible: trimmal carina with broad incision at about three quarters of length, the proximal section of incision forming small preapical tooth. Tergum VI moderately broad (Fig. 28). Length 7.9-8.6 mm; head width 2.4-2.6 mm.



FIGURES 26-28. *Pison adnyamathanha* Pulawski, sp. nov., female. (26) Clypeus and mandibles; (27) Head in dorsal view; (28) Apical terga in dorsal view.

FIGURE 29. Collecting localities of *Pison adnyamathanha* Pulawski, sp. nov.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 29).—New South Wales, South Australia, Western Australia.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **South Australia:** Wilpena Pound Gap at 31°33'S 138°36'E, 5-6 Nov 1987, I.D. Naumann and J.C. Cardale (ANIC).

**PARATYPES:** **AUSTRALIA:** **New South Wales:** Fowlers Gap Research Station at 31°05'S 141°42'E, 29 Nov – 2 Dec 1981, J.C. Cardale (1 ♀, ANIC); Menindee, 2 Dec 1971, N.W. Rodd (1 ♀, AMS; 1 ♀, CAS). **South Australia:** Kings Mill Creek near Arkaroola Homestead, G.F. Gross, 20 Oct 1969 (1 ♀, CAS) and 29 Oct 1969 (1 ♀, SAM); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, 21 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Western Australia:** Meekatharra-Billiluna Pool, Apr 1930 – Aug 1931, Canning Stock Route Expedition (1 ♀, SAM).

### *Pison amabile* Menke

Figures 30-42.

*Pison amabile* Menke, 2015:402, ♀, Holotype: ♀, Australia: Northern Territory: Areyonga (AEI), three paratypes examined.

**RECOGNITION.**—*Pison amabile* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, tegula partly impunctate and asetose, and setae appressed on tergum I; also, the pilosity of the head, thorax, and propodeum is intensely golden. Three other species are similar: *P. auratum*, *P. formosum*, and *P. basale*. *P. amabile* differs from



the three in having the mandible tridentate apically in the female and bidentate in the male (rather than unidentate), forewing yellowish, infumate along outer margin (Fig. 34) rather than nearly hyaline, infumate along outer margin, the female gena and forefemur with well-developed psammophores whose lengths are about equal to the greatest femoral width (versus no psammophores), clypeal lamella of male arcuate (rather than sharply pointed), and male sternum VIII rounded apically (rather than emarginate, only minimally so in *P. basale*). Some specimens of *P. amabile* are unusual in having the thorax and propodeum as well as most of the gaster ferruginous, only the head being black (this type of coloration is shared with *P. melanocephalum*).

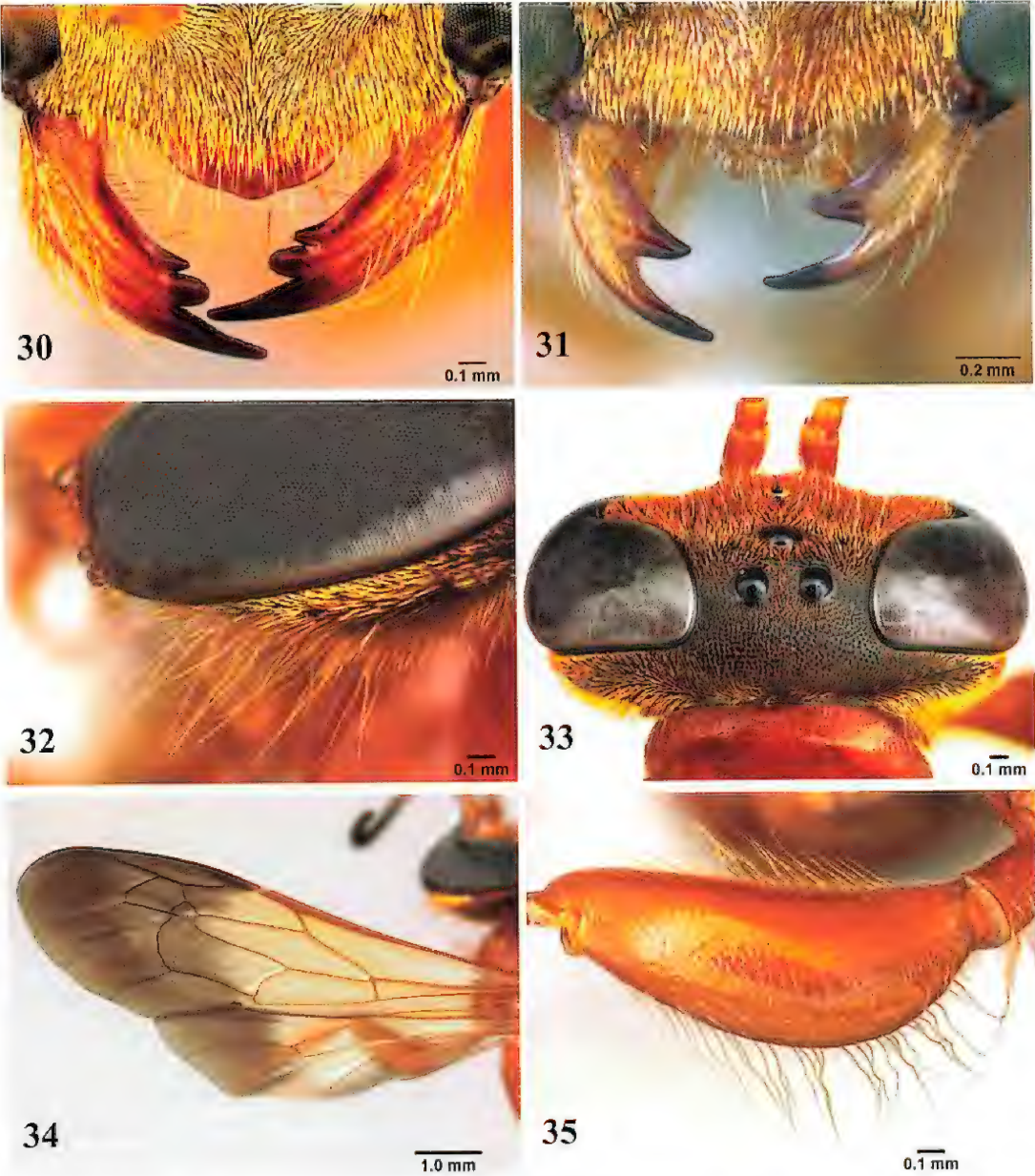
**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina widely separated from hypostomal carina, expanded in some specimens, its maximum height about  $0.5 \times$  midocellar diameter. Labrum not emarginate or shallowly emarginate. Antero-median pronotal pit transversely elongate, about twice as long as midocellar diameter. Propleural punctures several diameters apart at center. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures relatively small but well defined, less than one diameter apart; interspaces unsculptured, shiny. Tegula slightly enlarged. Mesopleural punctures, varying: less than one diameter apart in most specimens, but several punctures up to about three diameters apart in some, larger than those on scutum; interspaces unsculptured, shiny. Postspiracular carina present,  $0.7\text{--}1.5 \times$  as long as midocellar diameter. Metapleural sulcus not costulate or finely costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina or with evanescent carina separating side from dorsum and posterior surface; dorsum densely punctate (punctures compressed against each other, interspaces merging into minute ridges); side punctate, also ridged (at least anteriorly) in females and many males; posterior surface punctate, ridged next to median sulcus and also mesoventrally. Posteroventral forefemoral surface with well defined punctures more than one diameter apart; interspaces unsculptured, shiny. Tergum I sloping gently toward base, markedly less so than in most other *Pison*, in female slightly longer than apically wide; its punctures less than one diameter apart, more than one diameter apart in some specimens. Sterna II and III with punctures several diameter apart at center, apical depressions impunctate.

Setae bright golden on head, thorax, and propodeum, not concealing integument on clypeus; frons with short, dense, nearly appressed setae, and with sparse, erect setae whose length is about  $1.5 \times$  midocellar diameter; setae appressed on scutum and tergum I (more information on setae is given below), appressed frontal setae oriented ventrad between dorsal end of midfrontal carina and midocellus. Apical depressions of terga with ill-defined setal fasciae, visible only from certain angles.

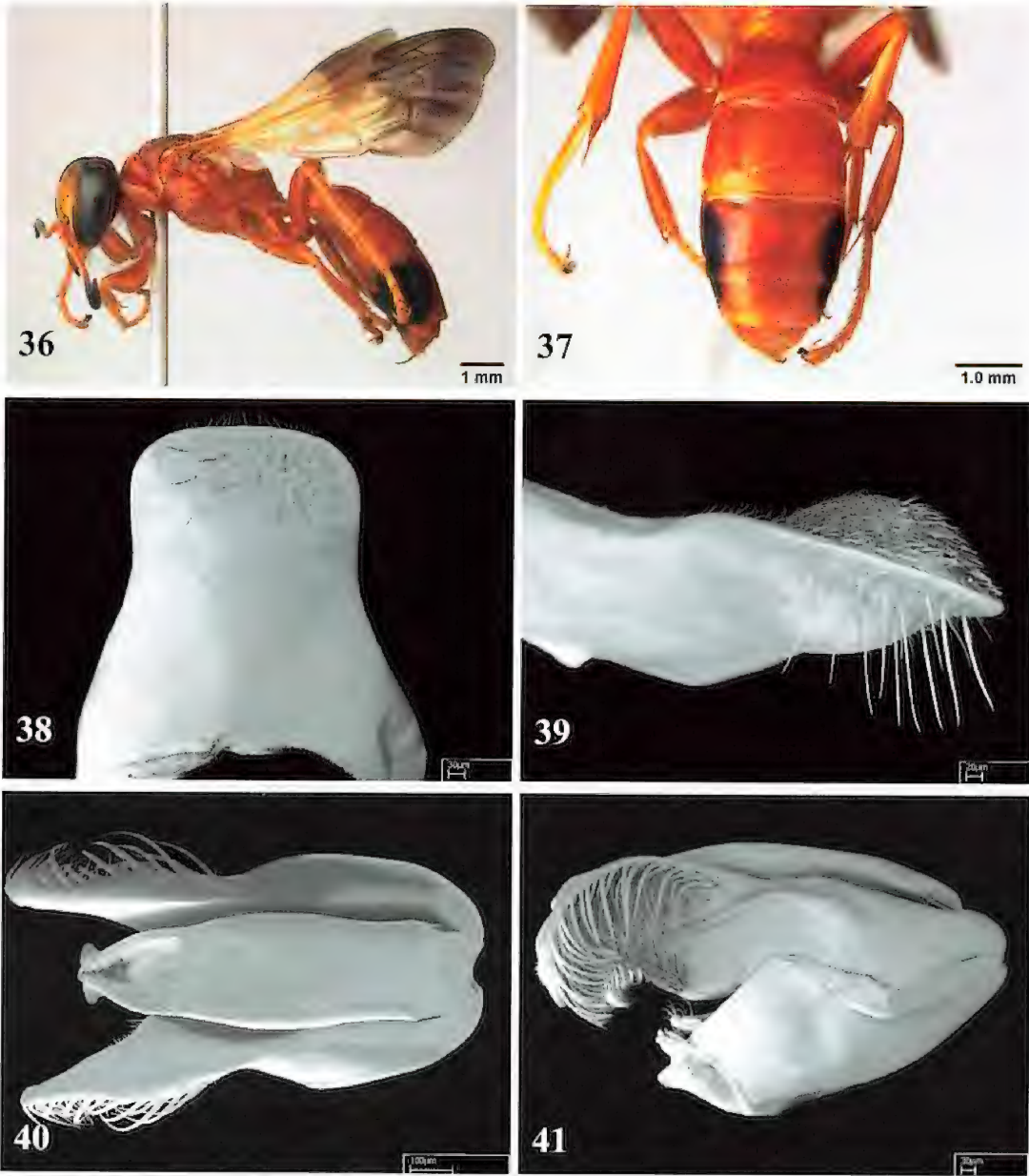
Head, thorax, and propodeum black in most specimens, but the following are ferruginous: scape (all or only ventrally), pedicel, and two or three basal flagellomeres; female clypeus narrowly ferruginous next to lobe free margin; mandible black or brown basally, yellowish reddish mesally, dark apically; pronotal lobe narrowly ferruginous posteriorly. In some specimens, thorax and propodeum ferruginous, all or partly. Wings yellowish in basal two thirds, infumate in apical third. Femora, tibiae, and tarsi ferruginous. Gaster in most specimens ferruginous except segment III black, in many specimens segment IV also black, all or basally; in some specimens gaster black except tergum I ferruginous, in others all ferruginous except a pair of large, lateral black spots on each tergum III and IV (Fig. 37).

♀ (Fig. 36).—Upper interocular distance equal to  $0.68\text{--}0.78 \times$  lower interocular distance; ocellular distance equal to  $1.1\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli  $0.8\text{--}1.2 \times$  hindocellar diameter (Fig. 33); eye height equal to  $0.86\text{--}0.89 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 30). Dorsal length of flagellomere I  $2.5\text{--}2.7 \times$





FIGURES 30–35. *Pison amabile* Menke. (30) Female clypeus and mandibles; (31) Male clypeus and mandibles; (32) Female gena showing psammophore; (33) Female head in dorsal view; (34) Female forewing; (35) Female forefemur showing psammophore.



FIGURES 36–41. *Pison amabile* Menke. (36) Female body in lateral view; (37) Female gaster in dorsal view; male: (38) Sternum VIII (ventral surface); (39) Sternum VIII in lateral view; (40) Genitalia in dorsal view; (41) Genitalia in lateral view.



apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible with one apical and two preapical teeth (Fig. 30), trimmal carina without incision. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores; longest setae of genal psammophore about  $1.0 \times$  greatest forefemoral width (Fig. 32), of mandibular psammophore about  $0.9\text{--}1.0 \times$  greatest forefemoral width, those of forefemoral psammophore about  $0.8\text{--}1.1 \times$  greatest femoral width (Fig. 35); lower gena impunctate and asetose between oral fossa and psammophore. Setae of inner margin of forebasitarsus longer than in other *Pison*. Tergum VI rounded apically. Length 9.3–11.2 mm; head width 2.8–3.2 mm.

♂.—Upper interocular distance equal to  $0.70\text{--}0.96 \times$  lower interocular distance; ocellular distance equal to  $1.3\text{--}1.8 \times$  hindocellar diameter, distance between hindocelli  $1.1\text{--}1.6 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.94 \times$  distance between eye notches. Clypeal lobe conspicuously narrow, free margin of lamella rounded or inconspicuously, obtusely pointed mesally (Fig. 31). Dorsal length of flagellomere I  $2.2\text{--}2.3 \times$  apical width, of flagellomere X  $1.1\text{--}1.2 \times$  apical width. Mandible bidentate apically (Fig. 31). Lower gena with erect setae that are  $1.5\text{--}2.0 \times$  midocellar diameter long. Sternum VIII with basomedian, unsculptured swelling, apical margin rounded (Figs. 38, 39). Genitalia: Figs. 40, 41. Length 8.2–9.7 mm; head width 2.4–2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 42).—Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.— AUSTRALIA: Northern Territory:** Areyonga (Menke, 2015), Gregory National Park at  $16^{\circ}03'01''\text{S } 130^{\circ}24'07''\text{E}$  (1 ♀, ANIC; 1 ♀, 1 ♂, USU), 28 km SE Katherine at  $14^{\circ}34.0'\text{S } 132^{\circ}28.5'\text{E}$  (2 ♀, 1 ♂, CAS), Keep River National Park at  $15^{\circ}45.4'\text{S } 129^{\circ}05.6'\text{E}$  (2 ♂, ANIC), at  $15^{\circ}45'44''\text{S } 129^{\circ}05'55''\text{E}$  (2 ♀, 3 ♂, ANIC; 4 ♂, CAS; 1 ♀, 3 ♂, USU), at  $15^{\circ}45'42''\text{S } 129^{\circ}06'45''\text{E}$  (1 ♂, USU), at  $15^{\circ}47'49''\text{S } 129^{\circ}06'31''\text{E}$  (1 ♀, ANIC; 2 ♂, USU), and at  $15^{\circ}57'55''\text{S } 129^{\circ}01'52''\text{E}$  (1 ♂, USU), 12 km NNW Mount Cahill at  $12^{\circ}46'\text{S } 132^{\circ}39'\text{E}$  (1 ♂, ANIC), Mount Ooraminna 46 km SE Alice Springs at  $24^{\circ}06'\text{S } 134.00'\text{E}$  (1 ♂, ANIC), Old Andado Homestead in Simpson Desert (1 ♂, ANIC). Stuart Point road 14.5 km N Arnhem Highway at  $12^{\circ}43.6'\text{S } 131^{\circ}50.0'\text{E}$  (1 ♀, CAS). **Queensland:** Langi Lagoon in Mungkan Kandju National Park at  $13^{\circ}27'\text{S } 142^{\circ}42'\text{E}$  (1 ♀, ANIC), Musselbrook camp at  $18^{\circ}36'\text{S } 138^{\circ}08'\text{E}$  (2 ♀, ANIC), 1 km N Rounded Hill near Hope Valley Mission at  $15^{\circ}17'\text{S } 145^{\circ}13'\text{E}$  (1 ♀, ANIC). **South Australia:** Ngarkat Conservation Park at  $35^{\circ}56'23''\text{S } 140^{\circ}21'06''\text{E}$  (1 ♂, SAM). **Western Australia:** Beverley Spring Station at  $17.93^{\circ}\text{S } 125.44^{\circ}\text{E}$  (1 ♂, WAM), 150 km ESE Broome at  $18^{\circ}55'\text{S } 123^{\circ}14'\text{E}$  (1 ♀, ANIC), 8 km S Cape Bertholet at  $17^{\circ}19'\text{S } 122^{\circ}10'\text{E}$  (1 ♀, 1 ♂, ANIC), 22 km E Cobra Station at  $24^{\circ}13.3'\text{S } 116^{\circ}33.1'\text{E}$  (1 ♂, ANIC; 2 ♀, USU), 51 km NE Kalbarri at  $27^{\circ}15'22''\text{S } 14^{\circ}19'58''\text{E}$  (1 ♀, WAM), Karijini National Park at  $22^{\circ}28.4'\text{S } 118^{\circ}32.6'\text{E}$  (1 ♂, CAS), Kennedy Range National Park at  $24^{\circ}38.7'\text{S } 115^{\circ}10.7'\text{E}$  (1 ♀, USU), 63 km E Marble Bar at  $21^{\circ}13.0'\text{S } 120^{\circ}20.2'\text{E}$  (1 ♀, 2 ♂, ANIC; 1 ♂, USU), 104 km E Marble Bar at  $21^{\circ}19.1'\text{S } 120^{\circ}40.3'\text{E}$  (5 ♀, CAS), Mount Augustus National Park at  $24^{\circ}21.7'\text{S } 116^{\circ}50.2'\text{E}$  (2 ♀, 2 ♂, CAS), Nanutarra - Wittenoom road 25 km NE railway crossing at  $22^{\circ}21'21''\text{S } 117^{\circ}54'16''\text{E}$  (2 ♂, AMS), 45 km S Newman on Great Northern Highway at  $23^{\circ}42.4'\text{S } 119^{\circ}44.3'\text{E}$  (1 ♂, ANIC), 47 km S Pardoo Roadhouse on Shay Gap road at  $20^{\circ}22.7'\text{S } 120^{\circ}01.3'\text{E}$  (3 ♀, 1 ♂, ANIC; 2 ♀, 1 ♂, CAS; 2 ♀, USU), 80 km S Pardoo Roadhouse at  $20^{\circ}28.3'\text{S } 120^{\circ}10.0'\text{E}$  (1 ♀, 1 ♂, USU), Rudall River 7 mi. WNW Poonamerlarr Sk. (1 ♂, ANIC), Tambrey, 3 Aug 1958, R.P. McMillan (1 ♀, WAM), Yalgourup National Park at  $32^{\circ}54.8'\text{S } 115^{\circ}42.1'\text{E}$ , (12 ♀, 9 ♂, CAS), Yandicoogina Creek 30 km E Marble Bar at  $21^{\circ}11.0'\text{S } 120^{\circ}01.7'\text{E}$  (3 ♀, ANIC).



FIGURE 42. Collecting localities of *Pison amabile* Menke.



*Pison angulare* Pulawski, species nova

Figures 43-50.

**NAME DERIVATION.**— *Angulare*, Latin neuter adjective meaning *which has angles*; with reference to the angular apical emargination of male sternum VII.

**RECOGNITION.**— *Pison angulare* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, tegula partly impunctate and asetose, and setae appressed on tergum I. The body is all black, but apical depressions of the terga in many males are brown and tergal setae golden, forming golden setal fasciae on apical depressions.

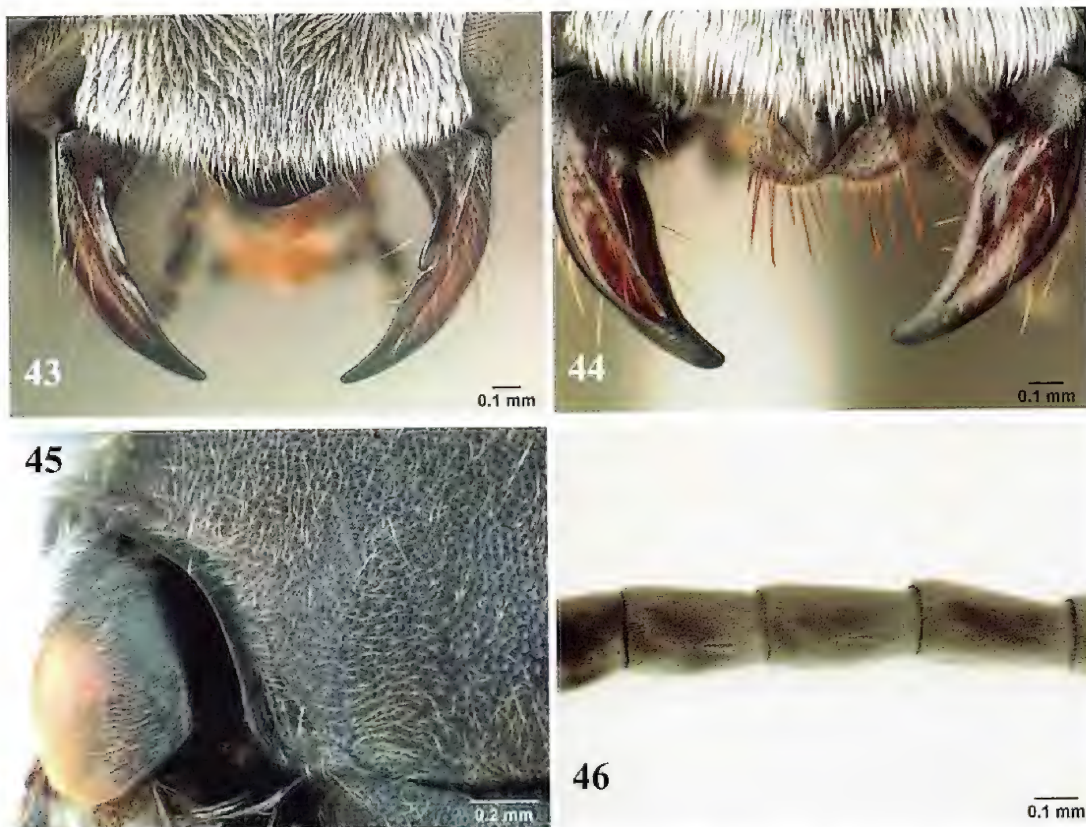
The female is mainly characterized by the absence of specializations found in other species. In particular, the clypeus is the usual shape, with a roundly arcuate lamella that is longer mesally than laterally, with a deeply concave free margin of the lateral clypeal section, and the surface not concave above the lamella, the gena is punctate and setose on each side of the oral fossa (genal setae sinuous, as long as  $1.5 \times$  midocellar diameter), the tegula is largely impunctate and asetose, the propodeum is ridged and punctate on the dorsum and has a carina separating the dorsum and posterior surface from the side and extending from the gastral socket area toward the spiracle, and sterna II-IV are punctate throughout. It can be distinguished from similar species by the following combination: ocellocular distance equal to  $0.9-1.2 \times$  hindocellar diameter; dorsal length of flagellomere I  $2.5-2.8 \times$  apical width; and all scutal punctures fine, separated by linear interspaces (Fig. 45). Unlike *P. marginatum*, the punctures are less than one diameter apart above the midfrontal carina (rather than about one diameter apart), and the punctures of the lower metapleuron are not markedly smaller than those of the adjacent propodeum. Unlike *P. translucens*, all tibiae are black rather than the hindtibia ferruginous.

The male is easily recognizable by its sternum VIII that has a glabrous basal area, in many specimens extending as a glabrous line to the apical margin, and the apical emargination either approximately rectangular or obtusely angulate (Fig. 47); the presence of tyloids on flagellomeres II-VIII, III-VIII or IV-VIII is a subsidiary recognition feature (Fig. 46).

**SEX ASSOCIATION.**— The females of *P. angulare* and *P. translucens* are almost identical morphologically (the clypeal lamella is minimally narrower in *P. translucens*). The males of these two species, however, are easily recognizable by a number of structural characters, and they also differ by the color of their tibia (black in *P. angulare*, at least the hindtibia ferruginous in *P. translucens*). I assume that the color of the tibiae is shared with the females. This assumption is supported by the fact that both sexes share the color of tibiae in localities where only one of these two species was collected.

**DESCRIPTION.**— Frons dull, punctate, punctures less than one diameter apart. Gena in female narrow in dorsal view. Hypostomal carina slightly expanded, particularly in some males. Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, at most with rudimentary longitudinal ridges adjacent to posterior margin; scutal punctures well defined, interspaces linear (Fig. 45). Tegula enlarged, its outer margin convex to nearly straight. Mesopleural punctures less than one diameter apart. Postspiracular carina rudimentary or absent. Metapleural sulcus costulate or not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum, irregularly ridged, punctate between ridges; side finely, irregularly ridged, punctate between ridges; posterior surface ridged. Posteroventral forefemoral surface finely punctate, punctures about one diameter apart. Most punctures of tergum I less than one diameter apart. Sterna punctate throughout.

Setae silvery on head and thorax, golden on terga, forming setal fasciae on apical tergal depres-



FIGURES 43-46. *Pison angulare* Pulawski, sp. nov. (43) Female clypeus and mandibles; (44) Male clypeus and mandibles; (45) Female tegula and adjacent scutum; (46) Male flagellomeres III-V.

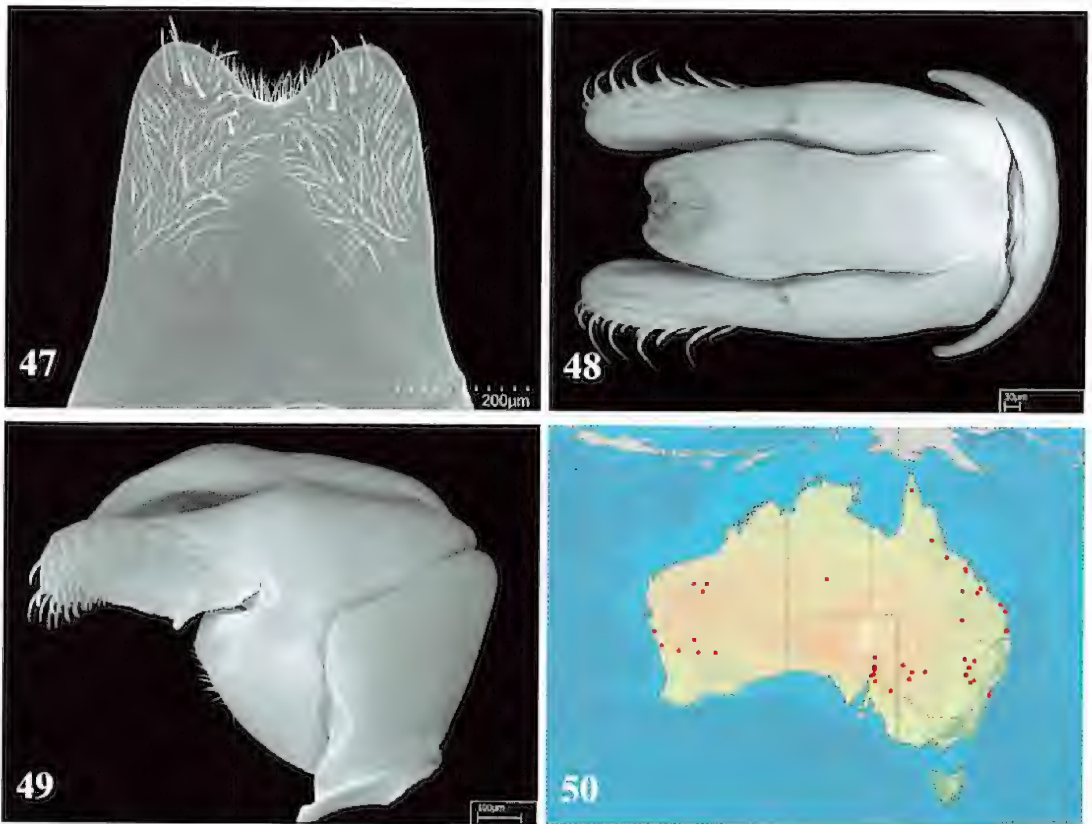
sions; both appressed and erect on frons and scutum; appressed on tergum I; oriented dorsally above dorsal end of midfrontal carina and oriented ventrad beneath midocellus, not completely concealing integument on clypeus in female, completely so in male (except lamella); setae of lower gena sinuous, up to  $1.5 \times$  midocellar diameter.

Body black in most specimens, but tarsomeres II-IV ferruginous in a male from Burrrendong Botanic Garden, New South Wales; mandible dark brown mesally (ferruginous in some males); apical depression of terga light brown (only apically on tergum I in many specimens).

♀.— Upper interocular distance equal to  $0.70-0.74 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.1 \times$  hindocellar diameter; eye height equal to  $0.90-0.92 \times$  distance between eye notches. Free margin of clypeal lamella obtusely arcuate (Fig. 43). Dorsal length of flagellomere I  $2.6-2.8 \times$  apical width, of flagellomere IX  $1.5-1.6 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 9.3-11.2 mm; head width 2.9-3.4 mm.

♂.— Upper interocular distance equal to  $0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.6-2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3-1.6 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 44). Flagellomeres II-VIII, III-VIII, or IV-VIII with tyloids (Fig. 46), flagellomeres IV-VI convex ventrally (slightly so in small specimens). Dorsal length of flagellomere I  $2.3-2.6 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII basomedially with glabrous area that extends as slightly raised, glabrous midline toward sternal apex (midline





FIGURES 47–49. *Pison angulare* Pulawski, sp. nov., male. (47) Sternum VIII (ventral surface); (48) Genitalia in dorsal view; (49) Genitalia in lateral view.

FIGURE 50. Collecting localities of *Pison angulare* Pulawski, sp. nov.

evanescent in some specimens); apical margin emarginate (emargination rectangular to obtuse), posterolateral arm broadly rounded (Fig. 47). Genitalia: Figs. 48, 49. Length 6.2–11.3 mm; head width 2.0–3.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 50).— All Australia except Victoria and Tasmania.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA: Queensland:** Amby, 22–27 Nov 1979, H.E. Evans, M.A. Evans, and A. Hook (QMB, registration number T228763).

**PARATYPES:** **AUSTRALIA: New South Wales:** Burrendong Botanic Garden at 32°42.1'S 149°06.2'E, 13 Dec 2009; V. Ahrens and W.J. Pulawski (6 ♂, CAS); Coolbaggie Forest Reserve 10 km E Eumungerie at 31°58.5'S 148°40.5'E, 25 Dec 2011, V. Ahrens and W.J. Pulawski (4 ♂, CAS); 1 km W Eumungerie at 31°56.7'S 148°36.9'E, 15 Dec 2009, V. Ahrens and W.J. Pulawski (4 ♀, 3 ♂, CAS); Fowlers Gap Research Station at 31°05'S 141°42'E, 29 Nov – 2 Dec 1981, J.C. Cardale (1 ♀, 1 ♂, ANIC), I.D. Naumann (1 ♀, ANIC), I.D. Naumann and J.C. Cardale (4 ♀, ANIC); Kinchega National Park at 32°23.7'S 142°22.7'E, 19 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); 16 km N Mudgee, 29 and 30 Nov 1982, D.S. Horning (1 ♀, 1 ♂, ANIC); 40.5 km SW Narrabri at 30°37.7'S 149°34.1'E, 5 Jan 2012, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Springs Creek 68 km SW Wilcannia at 31°44'S 142°41'E, 29 Nov 1981, J.C. Cardale and I.D. Naumann (1 ♀, ANIC); Sydney, no date, C. Gibbons (1 ♀, AMS); Warrenburg National Park, 20 Dec 1987, M.E. Irwin (4 ♀, 5 ♂, UCD), Warrumbungle National Park at 31°16.9'S 148°59.1'E, 21 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Warrumbungle National Park at 31°16'S 148°57'E, 17 Dec 1995, M.E. Irwin (1 ♀, MNKB); 87 km E Wilcannia at 31°42.8 S 144°08.6'E, V. Ahrens and W.J. Pulawski, 21 Dec 2011 (2 ♀, 19 ♂, CAS) and 23 Dec 2011 (3 ♀, 10 ♂, CAS; 1 ♀, 1 ♂, NHMW); Yelcomba at 30°27'40"S 148°31'44"E,



Feb 2001, I. Oliver (1 ♀, AMS). **Northern Territory:** 7 mi. S Ti-Tree Well, 28 Oct 1962, E.S. Ross and D.Q. Cavagnaro (1 ♂, CAS). **Queensland:** Batavia Downs at 12°40'S 142°30'E, 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (1 ♂, ANIC); Brisbane: Blunder Creek, 2-9 Oct 1979, A. Hook, H.E. Evans, and M.A. Evans (2 ♂, QMB); Brisbane: Karawatha Forest at 27°38.6'S 153°04.2'E, 12 Dec 2006, W.J. Pulawski (1 ♀, CAS); Bundaberg, Nov 1972, H. Frauca (2 ♂, ANIC); Bundaberg at Burnett River, 31 Jan 1973, H. Frauca (1 ♀, ANIC); Edungalba at 23°43'00"S 149°51'00"E, 1 Jan 1987, H. and A. Howden (4 ♀, 2 ♂, ANIC); Emerald, 31 Dec 1986, H. and A. Howden (2 ♂, ANIC); Eungella National Park at 21°10.5'S 148°30.3'E, 31 Oct 2006, V. Ahrens and W.J. Pulawski (3 ♀, 1 ♂, CAS); Homevale National Park at 21°26.9'S 148°32.4'E, V. Ahrens and W.J. Pulawski, 27 Nov 2012 (1 ♂, CAS), 28 Nov 2012, (1 ♀, CAS); Maaroom 20 km SE Maryborough at 25°36.7'S 152°52.2'E, 25 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Mornish: Black Mountain, 21 Nov 1971, C.G. Roche (2 ♂, CAS); 48 km E Mount Surprise at 18°09.0'S 144°43.6'E, V. Ahrens and W.J. Pulawski, 21 Nov 2012 (1 ♀, 7 ♂, CAS), 22 Nov 2012 (2 ♀, 8 ♂, CAS). **South Australia:** Aroona ruins in Flinders Ranges National Park at 31°17'S 138°35'E, 9 Nov 1987, I.D. Naumann and J.C. Cardale (10 ♂, ANIC); Brachina Gorge in Flinders Ranges National Park at 31°20'S 138°34'E, 4 Nov 1987 (1 ♂, ANIC) and 4-10 Nov 1987 (1 ♀, ANIC), I.D. Naumann and J.C. Cardale; Dingly Dell Camp on Orparina Creek at 31°21'S 138°42'E, 7 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♀, 10 ♂, ANIC); Gawler National Park at 32°35.1'S 135°26.3'E, V. Ahrens and W.J. Pulawski, 5 Jan 2011 (1 ♀, 8 ♂, CAS), 7 Jan 2011 (1 ♀, 3 ♂, CAS); Mount Serle in Northern Flinders Ranges, no date, Hale and Tindale (1 ♂, SAM); 79 km NNW Renmark at 33°31'S 140°24'E, 8 Nov – 12 Dec 1996, K.R. Pullen (1 ♀, 3 ♂, ANIC); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, V. Ahrens and W.J. Pulawski, 20 Dec 2010 (11 ♀, 22 ♂, CAS), 21 Dec 2010 (22 ♀, 29 ♂, CAS), 22 Dec 2010 (30 ♀, 41 ♂, CAS), 23 Dec 2010 (10 ♀, CAS), 27 Jan 2011 (3 ♀, 5 ♂, CAS), 28 Jan 2011 (2 ♂, CAS); 3 km ENE Wilpena in Flinders Ranges National Park at 31°31.0'E 138°36.6'E, V. Ahrens and W.J. Pulawski: 23 Dec 2010 (18 ♀, 24 ♂, CAS), 26 Jan 2011 (5 ♀, 12 CAS), 27 Jan 2011 (25 ♀, 18 ♂, CAS); 34 km S Wilpena, 4 Jan 1980, R.M. Bohart (4 ♀, 34 ♂, UCD); Wirreanda Creek 28 km SW Hawker at 32°05.9'S 138°17.7'E (6 ♂, CAS). **Western Australia:** 12 km ENE Comet Vale Siding at 29°57'S 121°07'E, 7-15 Mar 1979, T.F. Houston (2 ♂, WAM); Ethel Creek 300 mi. N Meekatharra at 22°54'S 120°10'E, 28 Nov 1971, N.S. Expedition IV (1 ♂, WAM); Irwin River at Strawberry Station 19 km W Mingenew, 2 Nov 1986, M.E. Irwin and E.I. Schlinger (1 ♂, CAS); Juna Downs Station at 22°41'36"S 118°42'19"E, 28 Oct – 2 Nov 2005, CVA [= Conservation Volunteers Australia] (1 ♀, 1 ♂, AMS, male labeled "A. Donnelly and CVA [= Conservation Volunteers Australia]"); 34 km SE Kalbarri at 27°48.3'S 114°26.2'E, 5 Nov 2008, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Mount Gibson Station, 26 Feb 2000, S.R. Patterson (2 ♂, WAM); 45 km S Newman on Great Northern Highway at 23°42.4'S 119°44.3'E, 24 Apr – 6 May 2003, M.E. Irwin and F.D. Parker (1 ♀, ANIC); Pigeon Rocks at 29°55'S 119°16'E (1 ♂, WAM); Youanmi at 28°37'S 118°50'E, 13 Oct 1974, A.M. and M.J. Douglas (1 ♀, WAM).

### *Pison angustivertex* Pulawski, species nova

Figures 51-58.

**NAME DERIVATION.**— *Angustivertex* is derived from two Latin words: *angustus*, narrow, and *vertex*; with reference to the narrow vertex of many specimens; a noun in apposition to the generic name.

**RECOGNITION.**— *Pison angustivertex* is an all black, small species (length 4.4-7.1 mm in female, 4.6-6.0 mm in male), with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and setae appressed on terga. It differs from similar species except *brachyceras* by the following combination: setae of the lower gena appressed or nearly so, shorter than the midocellar diameter, the tegula not extending beyond the anterior margin of the axilla, mesopleural punctures less than one diameter apart, the propodeum without the longitudinal carina separating the side from the dorsum and the posterior surface and extending from the gastral socket area toward the spiracle, and the propodeal dorsum obliquely ridged (ridges becoming evanescent toward margin), punctate between ridges. Unlike *brachyceras*, the ocellocular distance of *angustivertex* is smaller than the distance between the hindocelli (Fig.

54), the dorsal length of flagellomere I is  $1.8\text{--}2.2 \times$  apical width in the female and  $1.6\text{--}2.0 \times$  in the male, and the frontal punctures are minute (Fig. 53). In *brachyceras*, the ocellocular distance is greater than the interocellar distance, the dorsal length of flagellomere I is  $1.5\text{--}1.7 \times$  apical width in the female and  $1.4\text{--}1.5 \times$  in the male, and the frontal punctures are larger.

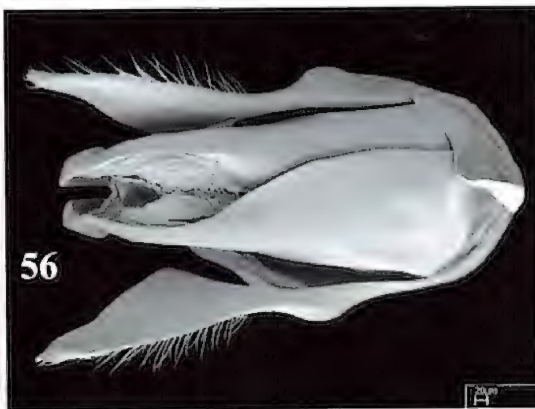
**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart (Fig. 53), middle supraantennal carina shorter than midocellar diameter, present only shortly above antennal insertion, more dorsally replaced by minute sulcus. Gena narrow in dorsal view (Fig. 54). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging about one diameter apart; interspaces microsculptured, dull. Tegula not enlarged. Mesopleural punctures fine, inconspicuous except well defined in female from 10 km W Cobra, Western Australia, less than one diameter apart; interspaces microscopically areolate, dull. Postspiracular carina present, slightly shorter than midocellar diameter. Metapleural sulcus impressed between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges becoming evanescent toward margin), punctate between ridges; side somewhat irregularly ridged, punctate between ridges; posterior surface ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I fine, averaging about one diameter apart. Sterna punctate throughout.

Setae silvery, appressed on frons, thorax, and tergum I, inconspicuous on frons, oriented



FIGURES 51–54. *Pison angustivertex* Pulawski, sp. nov. (51) Female clypeus and mandibles; (52) Male clypeus and mandibles; (53) Female frons; (54) Female head in dorsal view.





FIGURES 55–57. *Pison angustivertex* Pulawski, sp. nov., male. (55) Sternum VIII (ventral surface); (56) Genitalia in dorsal view; (57) Genitalia in lateral view.

obliquely dorsally in upper frons; on lower gena appressed to suberect, shorter than mid-ocellar diameter; not concealing integument on clypeus in female, completely concealing in male. Apical depressions of terga with silvery, setal fasciae.

Body all black except mandible yellowish brown in many specimens (black basally, dark brown apically).

♀.—Upper interocular distance equal to  $0.75\text{--}0.77 \times$  lower interocular distance; ocellocular distance equal to  $0.3\text{--}0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.2 \times$  hindocellar diameter (but 1.0 and 1.5, respectively, in specimen from 10 km W Cobra, Western Australia); eye height equal to  $1.08\text{--}1.12 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 51). Dorsal length of flagellomere I  $1.8\text{--}2.0 \times$  apical width, of flagellomere IX  $1.2\text{--}1.5 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 4.4–7.1 mm; head width 1.2–1.9 mm.

♂.—Upper interocular distance equal to  $0.60\text{--}0.78 \times$  lower interocular distance; ocellocular distance equal to  $0.7\text{--}0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $1.02\text{--}1.06 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 52). Dorsal length of flagellomere I  $1.6\text{--}2.2 \times$  apical width, of flagellomere X  $1.0\text{--}1.1 \times$  apical width. Sternum VIII with apical margin broadly emarginate (Fig. 55). Genitalia: Figs. 56, 57. Length 4.9–6.0 mm; head width 1.5–1.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 58).—Australian Capital Territory, Queensland, South Australia, Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Queensland: Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$ , 20 Oct – 16 Nov 1993, P. Zborowski and M. Horak (ANIC).

PARATYPES: AUSTRALIA: Australian Capital Territory: Black Mountain at  $35^{\circ}16'S$   $149^{\circ}06'E$ , Feb 1982, I.D. Naumann, J.C. Cardale, and M.E. Matthews (1 ♀, ANIC), Feb 1982, J.R.T. Short and C. Tidemann (1 ♀, ANIC), Mar 1982, I.D. Naumann and J.C. Cardale (2 ♀, ANIC), Nov 1982, I.D. Naumann and J.C. Cardale (1 ♀, 2 ♂, ANIC), Dec 1982, I.D. Naumann and J.C. Cardale (1 ♀, ANIC), 2 Jan 1987, I.D. Naumann (1 ♀, ANIC), and 4–10 Dec 1987, M.I. Irwin (1 ♀, CAS), and D.H. Colless, 30 Nov – 20 Dec 1979



(1 ♀, ANIC), 4-17 Feb 1980 (1 ♂, ANIC), 18-29 Feb 1980 (1 ♀, ANIC), 15-31 Mar 1980 (2 ♀, ANIC). **Queensland:** 7 km S Batavia Downs at 12°43'S 142°42'E, 24 May-17 June 1993, P. Zborowski and I.D. Naumann (1 ♀, ANIC); 3 km W Batavia Downs at 12°40'S 142°39'E, 16 Feb-8 Mar 1993, I. Cunningham (1 ♂, CAS); Cockatoo Creek Crossing 17 km NW Heathland at 11°39'S 142°27'E, 7 June - 25 July 1992, P. Zborowski and E. Nielsen (1 ♀, ANIC); Edungalba, 1 Jan 1987, H. and A. Howden (1 ♀, ANIC); 24 km NNW Heathlands at 11°33'E 142°28'E, 19 June 1993, I.D. Naumann and P. Zborowski (1 ♀, CAS); 12 km SSE Heathlands at 11°51'S 142°38'E, P. Feehney, 26 Jan - 1 Mar 1992 (1 ♂, ANIC) and 22 Mar - 25 Apr 1992 (1 ♀, ANIC); Homevale National Park at 21°26.9'S 148°32.4'E, V. Ahrens and W.J. Pulawski, 27 Nov 2012 (1 ♀, CAS); 14 km NW Hope Valley Mission at 15°16'S 144°59'E, 8-10 Oct 1989, J.C. Cardale (1 ♀, ANIC). **South Australia:** Aroona Ruins in Flinders Ranges National Park at 31°17'S 138°35'E, 9 Nov 1987, I.D. Naumann and J.C. Cardale (2 ♀, ANIC); Gammon Ranges National Park at 30°24'57"S 139°10'06"E, 20-23 Oct 1999, Flinders Range Survey (2 ♀, SAM); Mitcham, a southern suburb of Adelaide, 17 Nov 1979, R.Y. Southcott (1 ♀, SAM); 2 km SSW Spring Mount at 35°27'26"S 138°31'54"E, 6-10 Mar 1998, S.E.G. Flerieu (1 ♀, SAM); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, V. Ahrens and W.J. Pulawski, 21 Dec 2010 (2 ♀, CAS) and 27 Jan 2011 (1 ♀, CAS); 3 km ENE Wilpena at 31°31.0'S 138°36.6'E, 26 and 27 Jan 2011, V. Ahrens and W.J. Pulawski (2 ♀, CAS); Wilpena Pound Gap at 31°33'S 138°36'E, 5-6 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♂, ANIC). **Western Australia:** 10 km W Cobra Station 24°10.2'S 116°23.0'E, 26 Apr - 10 May 2003, M.E. Irwin and F.D. Parker (1 ♀, CAS); 82 km S junction with Karijini Drive on Great Northern Highway at 23°07.3'S 119°09.5'E, 23 Apr - 16 May 2003, M.E. Irwin and F.D. Parker (2 ♀, ANIC, USU).



FIGURE 58. Collecting localities of *Pison angustivertex* Pulawski, sp. nov.

### *Pison antennatum* Pulawski, species nova

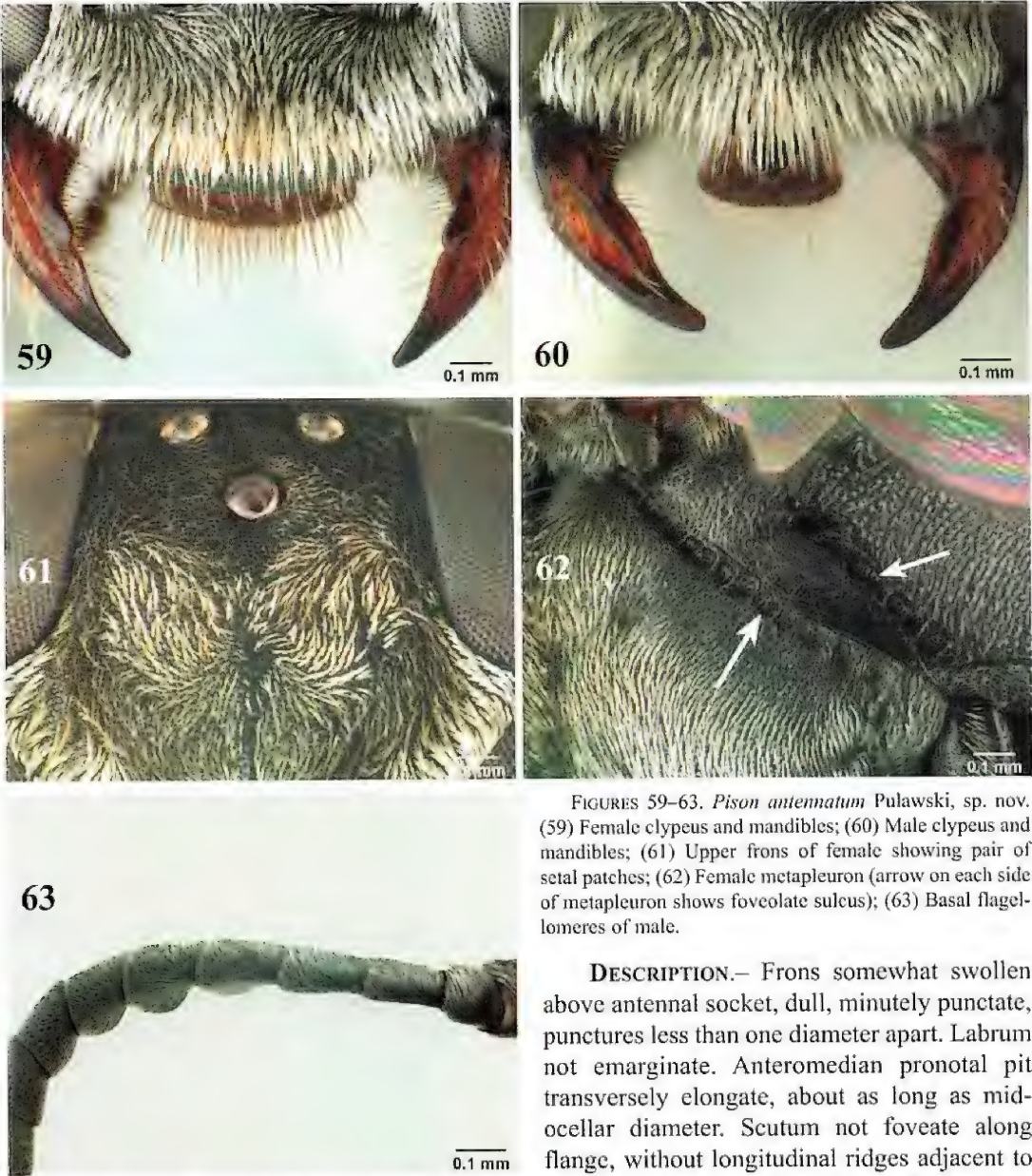
Figures 59-68.

**NAME DERIVATION.**— *Antennatum*, a Latin neuter adjective derived from *antenna*, which is characteristically expanded basally in the male.

**RECOGNITION.**— *Pison antennatum* is all black (apical depressions of terga brownish, hind-tibia narrowly ferruginous dorsally in one female examined), with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and setae appressed on tergum I. It is further characterized by the straight setae of the lower gena and the presence of a conspicuously areolate sulcus adjacent to both the anterior and posterior margins of the metapleuron, i.e., on the posterior margin of the mesopleuron and on the anterior margin of the propodeal side (Fig. 62). The latter feature is shared with *P. auriventre* and *P. sulcatum*.

The female can be recognized from similar species by a broad clypeal lamella, with a well defined, sharp corner (the distance between corners greater than the distance between a corner and the adjacent orbit) and a narrow clypeal lamella, as long mesally as laterally. The absence of psamphores on the gena and forefemur is a subsidiary recognition feature.

The male has flagellomeres III-V conspicuously convex ventrally and in addition sternum VIII with a narrow V-shaped impression subbasally (Fig. 64), a transverse preapical carina, and a non-emarginate apical margin (Fig. 65). Unlike *auriventre*, the gena is punctate and setose adjacent to the oral fossa.

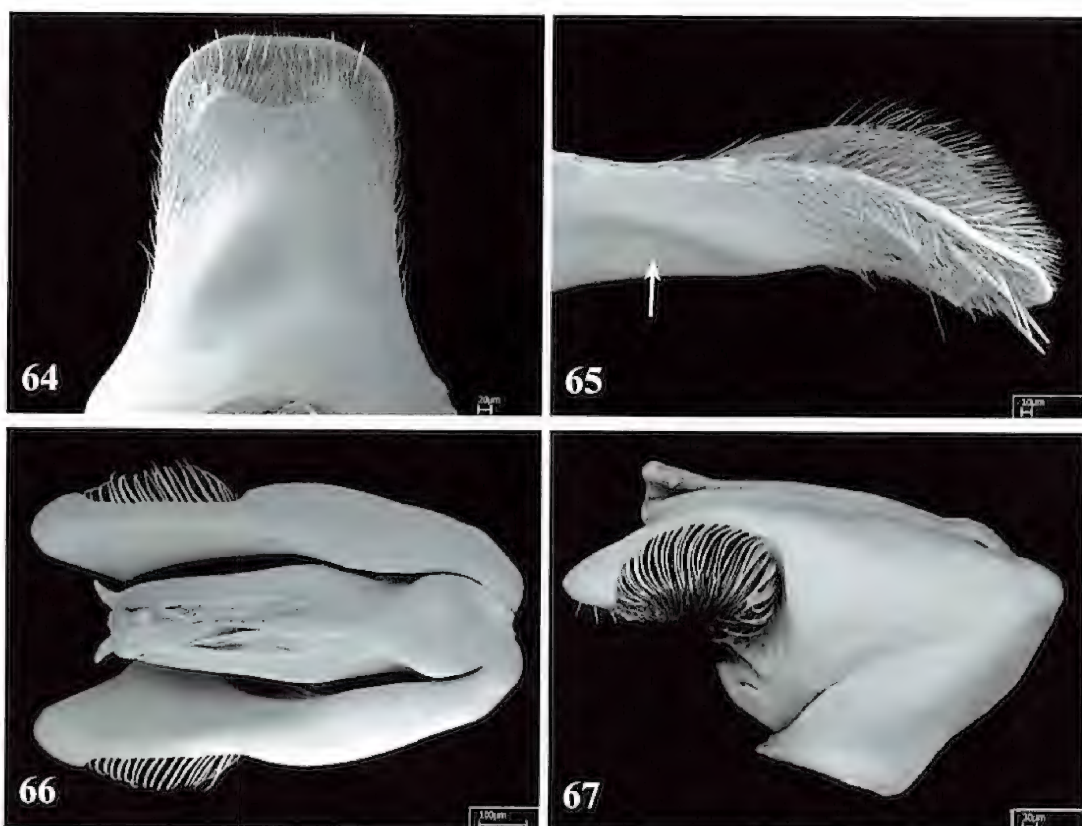


FIGURES 59–63. *Pison antennatum* Pulawski, sp. nov. (59) Female clypeus and mandibles; (60) Male clypeus and mandibles; (61) Upper frons of female showing pair of setal patches; (62) Female metapleuron (arrow on each side of metapleuron shows foveolate sulcus); (63) Basal flagellomeres of male.

**DESCRIPTION.**— Frons somewhat swollen above antennal socket, dull, minutely punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to

posterior margin; scutal punctures fine, less than one diameter apart. Scutellum with foveolate sulcus basally. Tegula slightly enlarged. Mesopleural punctures fine, less than one diameter apart. Postspiracular carina present, almost as long as midocellar diameter. Mesopleuron adjacent to metapleuron and propodeum adjacent to metapleuron below dorsal pit, each with conspicuously foveolate sulcus; metapleuron in most specimens conspicuously ridged between dorsal and ventral metapleural pits. Metapleural sulcus costulate between dorsal and ventral metapleural pits (Fig. 62). Propodeum with well-developed, irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (punctate between ridges), with ill-defined, sublateral carina (carina mainly recognized





FIGURES 64–67. *Pison antennatum* Pulawski, sp. nov., male. (64) Sternum VIII (ventral surface); (65) Sternum VIII in oblique lateral view (arrow shows V-shaped impression); (66) Genitalia in dorsal view; (67) Genitalia in lateral view.

because of differently oriented setae on each side); side slightly concave, either punctate (interspaces merging into fine ridges) or ridged (punctate between ridges); posterior surface conspicuously transversely ridged to conspicuously rugose. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I less than one diameter apart. Sterna finely, uniformly punctate throughout.

Setae silvery on head, thorax, and propodeum, appressed on frons, scutum, and tergum I, suberect on lower gena (longest setae about equal to midocellar diameter), forming dorsally oriented patch on each side of frons above dorsal end of middle carina but oriented ventrally below midocellus (Fig. 61), completely concealing integument on clypeus except lamella. Tergal setae with golden tinge, forming fasciae on apical depressions.

Body all black, mandible ferruginous except black basally and apically.

♀.—Upper interocular distance equal to  $0.78 \times$  lower interocular distance; ocellocular distance equal to  $1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.7\text{--}1.9 \times$  hindocellar diameter; eye height equal to  $1.08\text{--}1.10 \times$  distance between eye notches. Free margin of clypeal lamella only slightly convex, almost straight, with well-defined lateral corner (Fig. 59); distance between corners greater than between corner and adjacent orbit. Dorsal length of flagellomere I  $1.8\text{--}1.9 \times$  apical width, of flagellomere IX  $1.1\text{--}1.2 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Tergum VI obtusely rounded. Length 7.1–8.0 mm; head width 1.9–2.1 mm.

♂.—Upper interocular distance equal to  $0.84\text{--}0.88 \times$  lower interocular distance; ocellocular



distance equal to  $1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $2.0\text{--}2.1 \times$  hindocellar diameter; eye height equal to  $1.10\text{--}1.12 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 60). Flagellomeres III-V conspicuously convex ventrally, flagellomere VI shallowly concave basally (Fig. 63). Dorsal length of flagellomere I  $1.5\text{--}1.7 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII not emarginate apically, with narrow V-shaped impression subbasally (Fig. 64) and transverse carina preapically (Figs. 65); area posterad of carina extremely finely punctate. Genitalia: Figs. 66, 67. Length 6.8-7.2 mm; head width 1.8-1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 68).—  
New South Wales, Queensland.

**RECORDS.**—**HOLOTYPE:** ♂, **AUSTRALIA: New South Wales:** 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$ , 19 Dec 2009, V. Ahrens and W.J. Pulawski (AMS).

**PARATYPES:** **AUSTRALIA: New South Wales:** Burrendong Botanic Garden at  $32^{\circ}42.1'S$   $149^{\circ}06.2'E$ , 13 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♂, CAS); same locality and collectors as holotype, 15 Dec 2009 (1 ♀, 2 ♂, CAS), 19 Dec 2009 (3 ♀, 2 ♂, CAS), 20 Dec 2009 (2 ♂, CAS); Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$ , V. Ahrens and W.J. Pulawski, 17 Dec 2011 (2 ♀, 1 ♂, CAS), 18 Dec 2011 (1 ♀, 1 ♂, CAS), 19 Dec 2011 (3 ♀, CAS), and 20 Dec 2011 (2 ♀, 1 ♂, CAS).

**Queensland:** Emerald, 31 Dec 1986, H. and A. Howden (1 ♀, ANIC).



FIGURE 68. Collecting localities of *Pison antennatum* Pulawski, sp. nov

### *Pison areniferum* Evans

Figures 69-79.

*Pison areniferum* Evans, 1981:422, ♀. Holotype: ♀, Australia: Queensland: Amby (QMB), examined. — Cardale, 1985:257 (in catalog of Australian Sphecidae).

**RECOGNITION.**—*Pison areniferum* is an all black species with three submarginal cells, the second recurrent vein contiguous with second intersubmarginal vein or nearly so, setae appressed on tergum I, and relatively large tergal punctures.

The female has well-defined psammophores on the gena, mandibular posterior margin, propleural and forecoxal outer margins, and the foretrochanteral and forefemoral venters. Like *P. tomentosum*, the ocellocular distance of *P. areniferum* is minimally larger than the distance between the hindocelli (smaller in the other black species with psammophores). Unlike *P. tomentosum*, the scutal punctures of *P. areniferum* average more than one diameter apart (rather than less than one diameter apart), the interspaces are unsculptured, shiny (rather than microsculptured, dull), punctures of the horizontal part of tergum I average more than one diameter apart (rather than less than one diameter apart), and the setae of the mesopleuron and propodeal dorsum do not completely conceal the integument (rather than completely concealing it). Also, the tegula is longer in *P. areniferum* than in *P. tomentosum*.

The male lacks conspicuous recognition features, but it may be recognized by its black body in combination with the following: many scutal punctures more than one diameter apart, setae of the propodeal dorsum short, not extending beyond the lateral carina, tergal punctures relatively large, at least sternum III impunctate or sparsely punctate apicomeresally, and sternum VIII conspicuously punctate in the apical half, emarginate apically. Subsidiary recognition features are:

ocellocular distance equal to  $1.8-1.9 \times$  hindocellar diameter, markedly larger than distance between hindocelli, dorsal length of flagellomere I equal to  $2.1-2.2 \times$  apical width, and propodeal side separated from dorsum and posterior surface by a longitudinal carina.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Labrum slightly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate posterolaterally in female, densely punctate in male. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, many of them more than one diameter apart, some punctures 2-3 diameters apart; interspaces unsculptured, shiny. Tegula enlarged, its outer margin nearly straight near midlength. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with shallow median depression, with or without longitudinal carina, punctate (punctures less than one diameter apart), interspaces merging into small, irregular ridges; side punctate, not ridged, punctures (except anteriorly) less than one diameter apart; posterior surface ridged. Punctures of horizontal part of tergum I averaging more than one diameter apart. Sternum II punctate throughout, sparsely so mesally, apical depression impunctate apicomeresally; at least sternum III impunctate or sparsely punctate apicomeresally.

Setae silvery, appressed on frons, thorax, mid- and hindfemoral venter, and tergum I, completely concealing integument on clypeus, in female largely so on propodeal dorsum and mesopleuron; genal setae: see below.

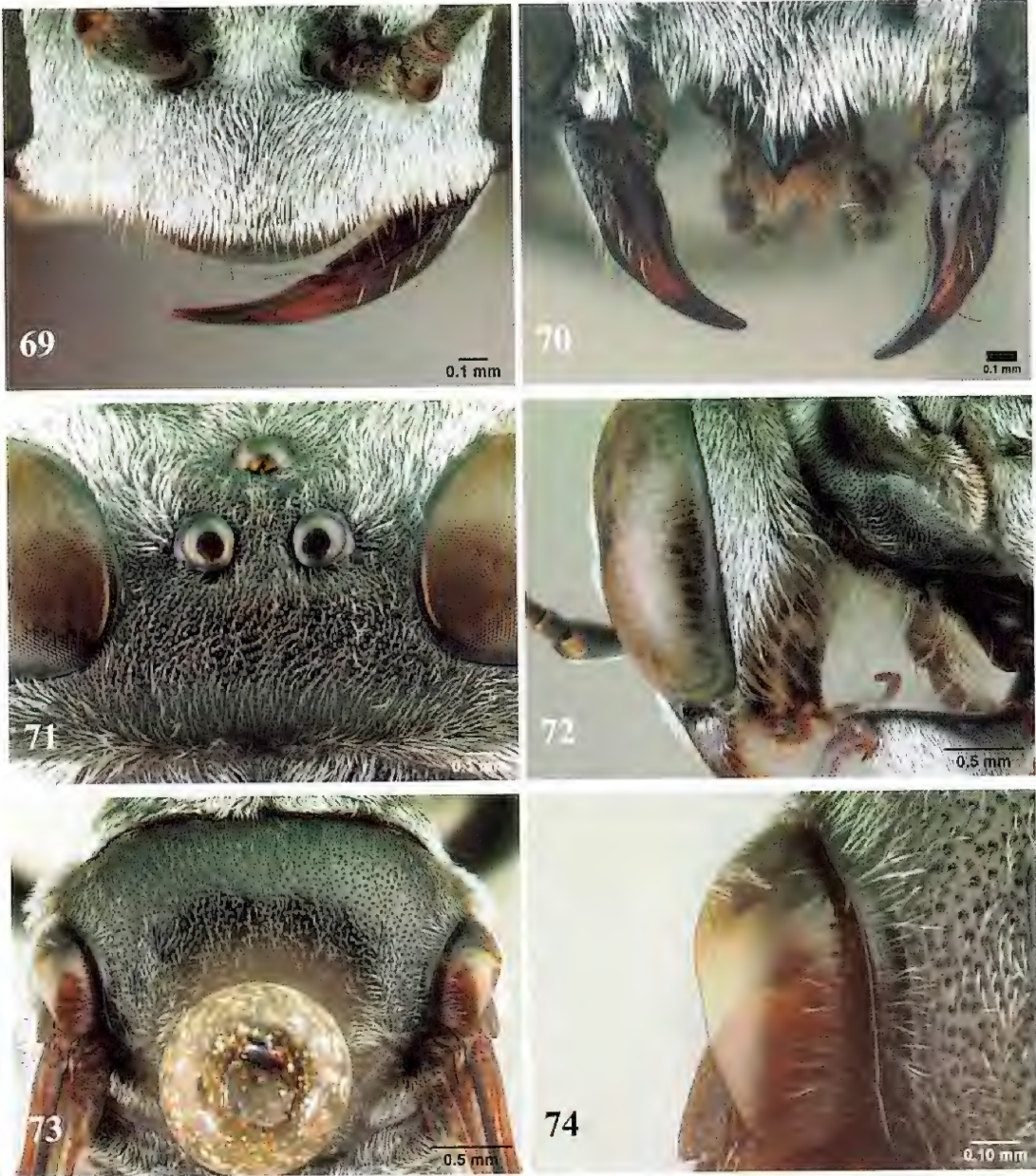
Head, thorax, propodeum, legs, and gaster black, mandible dark reddish preapically.

♀.—Upper interocular distance equal to  $0.66-0.68 \times$  lower interocular distance; ocellocular distance equal to  $1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.2 \times$  hindocellar diameter (Fig. 71); eye height equal to  $0.86-0.88 \times$  distance between eye notches. Clypeal lamella slightly longer mesally than laterally, distance between its corners slightly greater than distance between corner and adjacent orbit (Fig. 69). Dorsal length of flagellomere I  $2.5-2.7 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Gena, mandibular posterior margin, propleural and forecoxal outer margins, and foretrochanteral and forefemoral venters with psammophores; longest setae of genal psammophore about  $1.0 \times$  greatest forefemoral width (Fig. 72), of mandibular psammophore about  $0.9 \times$  greatest forefemoral width, of forefemoral psammophore about  $0.8 \times$  greatest forefemoral width (Fig. 75); lower gena impunctate and asetose between oral fossa and psammophore. Mandible: trimmal carina with minimal incision slightly beyond midlength. Length 9.9-10.1 mm; head width 3.1-3.2 mm.

♂.—Upper interocular distance equal to  $0.84-0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.8-1.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.3 \times$  hindocellar diameter; eye height equal to  $0.94-0.96 \times$  distance between eye notches. Free margin of clypeal lamella sharply angulate (Fig. 70). Setae of lower gena curved, longest setae up to  $1.5 \times$  midocellar diameter. Setae of propodeal dorsum short, not extending beyond lateral carina. Dorsal length of flagellomere I  $2.1-2.2 \times$  apical width, of flagellomere X  $1.1-1.2 \times$  apical width. Sternum VIII conspicuously punctate in apical half, emarginate apically (Fig. 76). Genitalia: Figs. 77, 78. Length 7.8-8.5 mm; head width 2.5-2.8 mm.

**NESTING HABITS.**—Evans (1981) observed two females nesting in a flat, sparsely vegetated sandy area near Amby, Queensland. Both females were digging nests, carrying sand from the burrow in their genal and forefemoral psammophores, flying with it about 1 m downwind and drooping it from a height of 30-40 cm; intervals between flight varied from 30 seconds to several





FIGURES 69–74. *Pison areniferum* Evans (69, 71–74: holotype). (69) Female clypeus and mandible; (70) Male clypeus and mandibles; (71) Female vertex; (72) Female gena in lateral view; (73) Female scutum; (74) Female tegula and adjacent scutum.





FIGURES 75–78. *Pison areniferum* Evans (75: holotype). (75) Female forefemur; male: (76) Sternum VIII (ventral surface); (77) Genitalia in dorsal view; (78) Genitalia in lateral view.

minutes. The author did not say whether they were flying backwards, as does *Gastrosericus siamensis* Tsuneki in similar situations. One nest was subsequently excavated: the burrow descended at about 45° angle, it was 14 cm long and reached a cell at a depth of 9 cm. It was open all the way to the cell except from a closure of sand at the entrance about 1 cm thick. A second cell was found 1.5 cm away, at a depth of 10 cm. It was closed off with sand and contained five spiders, all members of Oxyopidae: *Oxyopes mundulus* L. Koch, now *Oxyopes gracilipes* (White), and *O. punctatus* L. Koch.

**GEOGRAPHIC DISTRIBUTION** (Fig. 79).—New South Wales, Queensland, South Australia.

**RECORDS.**— **AUSTRALIA:** New South Wales: Springs Creek 68 km SW Wilcannia at 31°44'S 142°41'E (1 ♂, ANIC). **Queensland:** Amby (1 ♀, QMB, holotype of *P. areniferum*). **South Australia:** Chowilla Game Reserve 24 air km N Renmark at 33°58.0'S 140°48.8'E (3 ♂, CAS) and 34°00.0'S 140°49.4'E (3 ♂, CAS), Clements Gap Conservation Park at 33°28.7'S 138°03.9'E (1 ♀, 3 ♂, CAS), Port Clinton Conservation Park at 34°09.4'S 138°03.2'E (2 ♂, CAS).



FIGURE 79. Collecting localities of *Pison areniferum* Evans.

*Pison argentatum* Shuckard

Figures 80-89.

*Pison argentatum* Shuckard, 1838:79, ♀ (as *argentatus*, incorrect original termination). Holotype: ♀, Mauritius: no specific locality (OXUM), examined. – As *Pison argentatum*: Le Guillou, 1842:320 (Singapore); F. Smith, 1856:314 (in catalog of Hymenoptera in British Museum); Kohl, 1885:186 (in checklist of world *Pison*); de Saussure, 1892:528 (Madagascar, redescription); Bingham, 1897:220 (in revision of Indian sub-continent aculeates); Dalla Torre, 1897:710 (in catalog of world Hymenoptera); Turner, 1911:371 (Island of Aldabra); Bordage, 1912:32 (Isle of Réunion: nesting habits, occasional cleptoparasitism using nests of *Sceliphron hemipterum*, now *fuscum*); Kohl in Bordage, 1912:86 (description of ♂); Perkins, 1912:727 (introduced into Hawaii); Turner, 1916b:594 (in key to Afrotropical *Pison*), 619 (introduced to Hawaii); Bridwell, 1919b:123 (in key to Hawaiian *Pison*); Williams, 1919:143 (Philippines: Los Baños); Swezey, 1921:522 (Hawaiian Islands: Kauai); nec Maidl, 1924:234 (= *Pison carinatum* Turner, present correction), 1925:390 (Indonesia: Sumatra); Guiglia, 1928:500 (Somalia, almost certainly in error); Pagden, 1934:459 (Malay Peninsula; nests constructed of mud, prey: Lycosidae spiders; nest parasites: mutillid *Smicromyrme decora* (F. Smith) and bombyliid *Petrorossia ceylonica* Brunetti; hyperparasite: *Melittobia hawaiiensis* Perkins); Swezey, 1942:185 (Guam, nesting habits); Arnold, 1945:3 (in key to *Pison* of Madagascar); Krombein, 1949:384 (in key to Sphecidae of Micronesia), 403 (diagnostic characters; Mariana and Caroline Islands), 1950:139 (island of Yap); Vesey-Fitzgerald, 1956b:362 (Seychelles); Evans, 1957b:98 (description of larva); Yoshimoto, 1960:334 (Hawaiian Islands); Tsuneki, 1963:11 (Thailand); Iwata, 1964b:374 (nesting habits in Thailand); Yoshimoto, 1965:291 (nesting habits); Baltazar, 1966:335 (in catalog of Hymenoptera of Philippines); Tsuneki, 1974:636 (Thailand); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Casolari and Casolari Moreno, 1980:114 (specimens in M. Spinola collection); Tsuneki, 1983a:89 (Philippines; comparison with *Pison ignavum*), 102 (in key to *Pison* of Philippines); Radović, 1985:65 (sting apparatus analyzed); Callan, 1990:20 (New Caledonia: no specific locality); Madl, Matyot, and Schödl, 1996:832 (Seychelles Islands); D. Baker, 1998:173 (origin and depository of type material); Kami and Miller, 1998:57 (in checklist of Samoan insects); Pulawski, 2003:797 (in checklist of Malagasy Sphecidae); Starr, 2004:565 (nesting habits); Evenhuis, 2007:6 (in checklist of Hymenoptera of Fiji); Terayama and Nambu, 2009:5, 18 (in key to Trypoxylini of Japan); Haneda, 2011:46 (Philippines: Palawan); Pagliano, 2011a:114 (specimens in coll. Spinola, Torino, are *Pison* sp.); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia); Madl, 2014a:976 (in catalog of Ampulicidae, Crabronidae, and Sphecidae of Madagascar, with synonymy and locality records). – As *Pisonitus argentatus*: F. Smith, 1869a:298 (new combination, in checklist of *Pisonitus*), 1871a:366 (in catalog of Oriental Aculeata).

*Pison saravakense* Cameron, 1903:163, ♀. Lectotype: ♀, Malaysia: Borneo (Sarawak): no specific locality (BMNH), **present designation**, examined. **New synonym**. – R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae).

*Pison ignavum* Turner, 1908:511, ♀, ♂. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. **New synonym**. – Turner, 1910:355 (as synonym of *Pison argentatum*), 1916b:596 (in key to Australian *Pison*), 601 (as Australian ssp. of *Pison argentatum*; Fiji), 1919:338 (Fiji, Queensland); Williams, 1932:152 (Marquesas Islands), 1945:440 (New Caledonia, recognition characters), 1947:318 and 330 (Fiji); Krombein, 1949b:385 (in key to Sphecidae of Micronesia), 404 (Caroline Islands); Yasumatsu, 1953:140 (bibliographic references, geographic distribution); Fullaway, 1957:279 (in checklist of Hymenoptera of Fiji); Tsuneki, 1967:21 (Taiwan), 1971:19 (Taiwan); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Tsuneki, 1976:95 (Philippines); Evans, Matthews, and Hook, 1981:222 (nest structure); Tsuneki, 1982a:36 (Bismarck Archipelago), 1983a:89 (Philippines), 102 (in key to *Pison* of Philippines), 1983b:42 (in key to *Pison* of New Guinea), 45 (New Guinea); Cardale, 1985:260 (in catalog of Australian Sphecidae); Radović, 1985:65 (sting apparatus analyzed); Callan, 1990:20 (New Caledonia: no specific locality); Porter, Stange, and Wang, 1999:9 (in checklist of Sphecidae of Taiwan). – As *Pison argentatum ignavum*: Cheesman, 1928:177 (Marquesas and Society Islands); Perkins and Cheesman, 1928:6 (listed from Samoa), 28 (Samoa); Kami and Miller, 1998:57 (in checklist of Samoan insects); Evenhuis, 2007:6 (in checklist of Hymenoptera of Fiji); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia).

As *Pison perplexum*: Roth, 1885:321 (nest structure, prey, as *perplexus*), present correction.

**SPECIES IDENTITY.**— The identity of *Pison argentatum* was not firmly established in the XIX<sup>th</sup> and XX<sup>th</sup> centuries. Apparently, none of the previous authors examined the holotype, but I received it for study through the kindness of Dr. James E. Hogan. The holotype, preserved in the Westwood collection at the Oxford University Museum, United Kingdom, is a male lacking the head, prothorax, and forelegs. Nevertheless, it is certainly conspecific with the specimens from Australia, Bali, East Malaysia, Java, New Guinea, Philippines, Singapore, and Sri Lanka in the California Academy of Sciences collection. It shares with them the second recurrent vein reaching the second submarginal cell at the middle of its length, the fine scutal punctures, the tegula of the usual form, the well-defined ridges on the propodeal dorsum, the non-pedunculate gaster, and the all-black body. Its sternum VIII has a well-defined apical emargination.

**LECTOTYPE DESIGNATIONS.**— Cameron (1903) did not indicate the number of specimens examined in his description of *Pison sarawakense*. I have designated as the lectotype of this species the only female present under this name in The Natural History Museum, London. Similarly, Turner (1908) did not indicate the number of specimens examined in his description of *Pison ignavum*. Of the five females of this species present in The Natural History Museum, London under this name, I have designated one as the lectotype and the remaining ones as the paralectotypes.

**RECOGNITION.**— *Pison argentatum* has the head, thorax, propodeum, and gaster all black (legs partly ferruginous in some Australian specimens), the second recurrent vein received near the middle of the second submarginal cell, the pronotal collar concealed by setae, and the tibial spurs whitish. Also, the scutal flange is slightly projecting beyond the anterior margin of the axilla, the posterior scutal margin is slightly concave next to the apex of the flange, and the propodeal dorsum is ridged in the vast majority of specimens. *Pison rufipes* is similar, but in *P. argentatum* the erect setae of the upper frons are about as long as  $0.5 \times$  midocellar diameter, although a few sparse setae may be as long as midocellar diameter ( $1.0\text{--}1.5 \times$  midocellar diameter in *P. rufipes*). In the female of *P. argentatum*, the ocellocular distance equals  $0.6\text{--}1.1 \times$  hindocellar diameter ( $1.2\text{--}1.5 \times$  in *P. rufipes*), and the legs are black in the vast majority of specimens, but partly ferruginous in some (in *rufipes* the legs are mostly ferruginous, but exceptionally all black, as in *P. argentatum*). The males are easily differentiated by the sculpture and pilosity of sternum VIII: in *P. argentatum*, it is unsculptured and asetose except near the hindmargin, whereas in *P. rufipes* it is punctate and setose (except basally); the leg color is as in the females. Also *Pison prostratum* resembles *P. argentatum*, but in that species the setae of the upper frons are appressed (erect, about as long as half width of the midocellus in *P. argentatum*) and the ocellocular distance is smaller than the distance between the hindocelli (the ocellocular distance and the distance between the hindocelli are about equal in the female of *P. argentatum*).

**JUSTIFICATION OF NEW SYNONYMY.**— *Pison sarawakense* Cameron, 1903 is certainly conspecific with *Pison argentatum* Shuckard. The two names are therefore synonyms.

Turner (1910) thought that his *P. ignavum* (described in 1908) was a junior synonym of *P. argentatum*, and later (1916b) treated it as the Australian subspecies of *P. argentatum*, whereas Williams (1932) and Krombein (1949) regarded them to be separate species (although Krombein called *P. ignavum* to be "uncomfortably close to *argentatum*"). The differences between the two species were supposed to be the shape of the clypeal lamella in both sexes and the shape of male sternum VIII. The clypeal lamella of the female, however, varies from slightly, evenly arcuate to one with a well-defined median projection, with intermediates. Moreover, it is not correlated with the shape of the male clypeus. For example, the males from the Wonga Beach, Queensland have the clypeal lamella widely obtusely angulate, whereas in the females it has a minimal median projection, and all four males examined from Moorea, French Polynesia also have the clypeal lamella widely obtusely angulate, but in the females the clypeal lamella varies from slightly,



evenly arcuate to one with a well-defined median projection, with intermediates. As these females were found the same day at the same locality, I think it unlikely they represent two species.

The male of *P. argentatum* was supposed to have the clypeal lamella widely obtusely angulate and the apical margin of sternum VIII with a well-defined, moderately deep emargination, whereas in *P. ignavum* the clypeal lamella was obtusely pointed and sternum VIII was shallowly emarginate apically. A male from Suva, Fiji, however, combines the clypeal lamella of *P. argentatum* with sternum VIII of *P. ignavum*, and in other males from that locality sternum VIII is intermediate. Most males from Australia have the clypeal lamella obtusely pointed, but the point is barely expressed in a specimen from 1 km W Eumungerie, New South Wales, suggesting full intergradation.

Based on the above observations, I treat *P. ignavum* as conspecific with *P. argentatum*, and a junior synonym of the latter name.

**DESCRIPTION.**—Frons dull minutely punctate, punctures shallow, about one diameter apart. Distance between antennal socket and orbit equal to socket diameter in female, slightly larger than that in male. Occipital carina higher than hypostomal carina. Gena narrow in dorsal view. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as 1.0-1.5 midocellar width. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine, on disk averaging about two diameters apart; interspaces microsculptured, dull; scutal flange slightly projecting beyond anterior margin of axilla, posterior scutal margin slightly concave next to apex of flange. Scutellum in most specimens with crenulate sulcus adjacent to scutal margin, but sulcus practically absent in specimens from Magnetic Island, Queensland, and intermediate in some others. Tegula not enlarged. Mesopleural punctures minute, averaging about one diameter apart, more than one diameter apart in some Australian males, partly concealed by vestiture, interspaces unsculptured. Postspiracular carina present, 1.0-1.5  $\times$  as long as midocellar diameter. Metapleural sulcus costulate and sunken between dorsal and ventral metapleural pits; metapleural punctures microscopically small. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with well-defined, oblique ridges in most specimens, but ridges evanescent in some specimens; side ridged at least dorsally; posterior surface transversely ridged; entire propodeum minutely punctate between ridges. Second recurrent vein received near midlength of submarginal cell II. Hindcoxal dorsum with outer margin rounded, not carinate. Punctures of tergum I minute, averaging about one diameter apart anterior of apical depression. Sterna evenly punctate throughout, those of sternum II averaging about 1-2 diameters apart mesally.

Setae silvery, subappressed on upper frons, appressed on scutum and tergum I, forming patch of dorsolaterally oriented setae on each side of upper frons (between dorsal end of middle carina and midocellus), on lower gena suberect, straight (curved apically), shorter than midocellar diameter; completely concealing integument on clypeus and pronotal collar. Apical depressions of terga with silvery, setal fasciae.

Body black, mandible ferruginous mesally, legs partly ferruginous in some specimens from Australia.

♀.—Upper interocular distance equal to 0.82-0.88  $\times$  lower interocular distance; ocellular distance equal to 0.6-1.1  $\times$  hindocellar diameter, distance between hindocelli equal to 0.8-1.1  $\times$  hindocellar diameter; eye height equal to 1.04-1.14  $\times$  distance between eye notches. Free margin of clypeal lamella slightly obtusely angulate to practically straight (Fig. 80) in specimens from Seychelles, Eastern Malaysia, Philippines, Singapore, and Thailand, but varying from slightly, evenly arcuate to one with a well-defined median projection (with intermediates) in other areas (Australia, island of Moorea). Dorsal length of flagellomere I 2.2-2.7  $\times$  apical width, of flagellomere IX

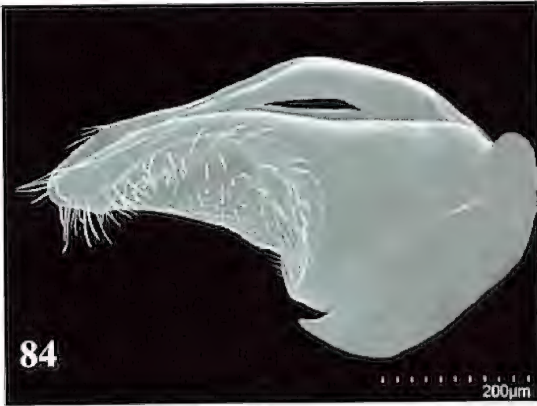
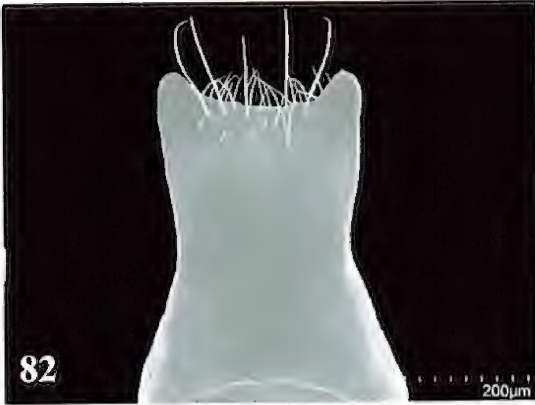
1.1-1.3  $\times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 5.8-8.5 mm; head width 1.8-2.4 mm.

♂.— Upper interocular distance equal to 0.84-0.90  $\times$  lower interocular distance; ocellocular distance equal to 0.7-1.3  $\times$  hindocellar diameter, distance between hindocelli equal to 0.8-0.9  $\times$  hindocellar diameter; eye height equal to 1.04-1.10  $\times$  distance between eye notches. Free margin of clypeal lamella varying from obtusely angulate (Fig. 81) to one with obtuse median point. Dorsal length of flagellomere I 1.6-1.9  $\times$  apical width, of flagellomere X 1.1-1.4  $\times$  apical width. Sternum VIII ventrally unsculptured except for setigerous punctures adjacent to apical margin, with well-defined, moderately deep apical emargination (Fig. 82). Genitalia: Figs. 83, 84. Length 5.6-8.0 mm; head width 1.7-2.1 mm.

**NESTING HABITS.**— The nesting habits of this species were observed by Bordage (1912) Cheesman (1928, as *P. ignavum*), Pagden (1934), Swezey (1942), Williams (1945, as *P. ignavum*), Iwata (1964b), Yoshimoto (1965), Evans, Matthews, and Hook (1981, as *P. ignavum*), and Starr (2004), of which Bordage is the most detailed. Bordage (1912) indicated that *P. argentatum* was very common on the island of Réunion, while Cheesman (1928) reported that the species was very numerous on the Society and the Marquesas islands “where these wasps build cells of clay pellets, usually choosing a sheltered position on walls, inside buildings, or under the eaves, against flat surfaces under overhanging rocks, suspended in clusters from exposed roots, in the interstices between the cells of *Sceliphron*, or on the undersurfaces of leaves, etc.”. Williams (1945) found that in New Caledonia the species “constructs free cells of mud pellets and sometimes hangs them from rootlets exposed in the bank”. Evans, Matthews, and Hook (1981) described a nest plastered to the underside of a *Banksia* leave overhanging a stagnant pool near Brisbane, Queensland; the nest was 4.5 cm long, 3.1 cm wide, and 0.8 cm deep. The nests are commonly found on buildings and other human-made structures, in a variety of situations, usually in somewhat protected places. Yoshimoto (1965) describes nesting of *Pison argentatum* in the entrance wall of the Bishop Museum in Honolulu, Hawaii. Some nests are built inside old cells of other dauber wasps such as *Sceliphron* sp. or *Eumenes* sp. Nests are built out by adding individual pellets of mud; they are smooth on the inner side and rough on the outer side (Fig. 85). An individual cell is about 10-11 mm long, about 7-9 mm in diameter, with walls about 0.5 mm thick. The cell is opened at the top prior to provisioning, and is closed by a circular operculum about 3 mm across when provisioning is completed and the egg laid. The nest may consist from one up to 24 cells (Iwata, 1964). Nests may be covered by a plastering, an additional mud layer making individual cells unrecognizable. When the substrate is an approximately flat surface, the cells tend to form a line, with new cells added serially at one end only; when the substrate departs clearly from the horizontal, new cells are added at the top. The female works on one cell at a time. Starr (2004) confirmed the previous observations.

Roth (1885) observed the nesting habits of what he called *Pison spinolae* and *P. perplexum* at Mackay, Queensland, and provided the following description: “The nests are exceedingly brittle, and are apparently formed of small particles of loose dry earth stuck together by some gummy fluid secreted by these wasps. They fill their nests exclusively with small spiders, and the larva makes itself a dull grey brittle shell in the cell”. The determination of *Pison spinolae* is certainly in error, as this species does not range as far north as Mackay. A specimen of *Pison argentatum* (as *ignavum*) at the BMNH bears the following labels: “85/2”, “Australia, pres[ented by] Henry Ling Roth, BMNH (E) 1885-2, and “see Roth, 1885, ...habits of some Australian Hymenoptera ... J. Linn. Soc., Zool. 18:321”. I believe this specimen is what Roth called *Pison perplexum*.

The prey consists of spiders of the genera *Attus* (now *Salticus*), Salticidae and *Sphasus* (now *Peucetia*), Oxyopidae (Bordage, 1912), immature *Pardosa*, Lycosidae (Pagden, 1934), and members of Araneidae, Lycosidae, Oxyopidae, and Salticidae (Starr, 2014).



FIGURES 80–85. *Pison argentatum* Shuckard.  
(80) Female clypeus and mandibles; (81) Male clypeus and mandibles; male: (82) Sternum VIII (ventral surface); (83) Genitalia in dorsal view; (84) Genitalia in lateral view; (85) Nest of *Pison argentatum* Shuckard.

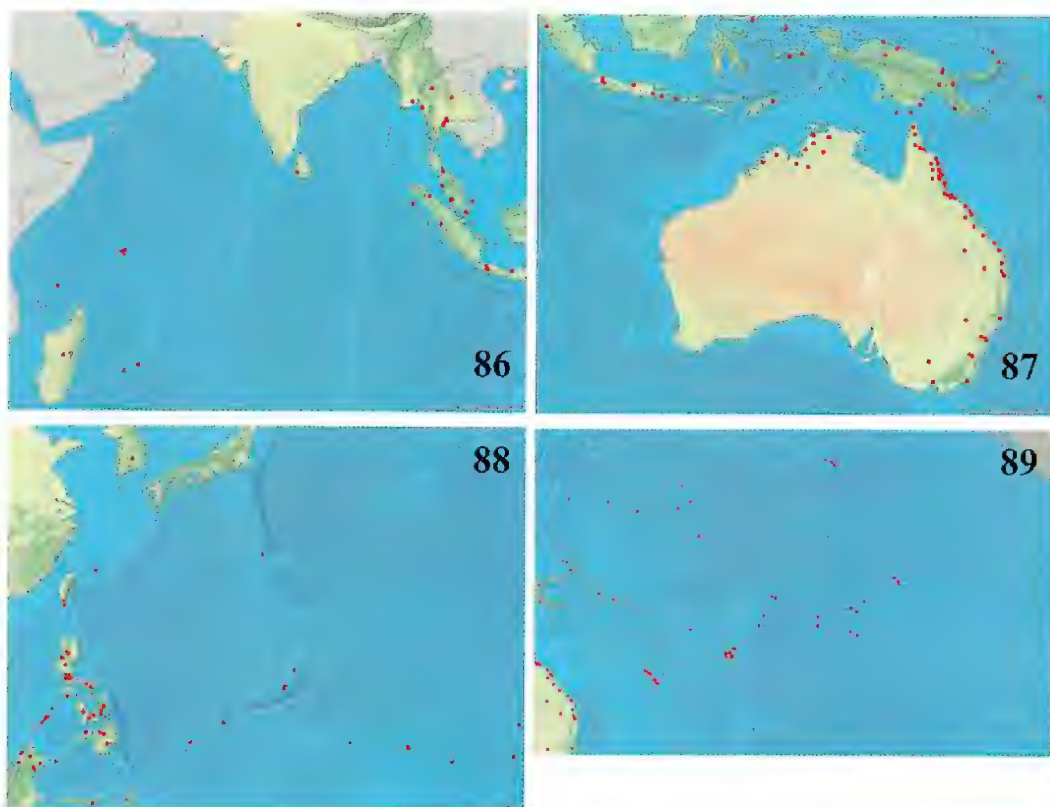


Bordage (1912) observed the growth and behavior of larvae in artificial nests (glass tubes).

A nest collected on the Magnetic Island, Queensland, by R.W. Matthews (ANIC) is illustrated in Fig. 82.

**GEOGRAPHIC DISTRIBUTION** (Figs. 86-89).— Unquestionable data exist for Australia, East Timor, Indonesia, Korea, Malaysia, Myanmar, Papua New Guinea, Philippines, Seychelles, Sri Lanka, Taiwan, Thailand, and Pacific Islands.

The species was also recorded from Madagascar by de Saussure (1892) and I was able to examine his specimen and to confirm his identification. Curiously, however, no additional specimen has been found in Madagascar in the subsequent 125 years in spite of extensive collecting there (Arnold, 1945, Pulawski, 2003, and Madl, 2014 only repeated de Saussure's record). Possibly de Saussure's specimen was mislabelled. The origin of the type (Mauritius) given by Shuckard, 1838 may be incorrect (as suggested by Turner, 1916b:619). The records from India and some western Indian Ocean islands (Aldabra, Réunion) are more than a hundred years old and have not been confirmed by recent findings. The species was incorrectly recorded from continental Africa: from Somalia: Giohar (as Duca degli Abruzzi) by Guiglia (1928) and from Sudan: Atbara by Maidl (1934). I have examined the specimen from Sudan determined by F.F. Kohl and recorded by Maidl, and this is no doubt *Pison carinatum* Turner, conspecific with individuals from several African countries (Egypt to Kenya) in the California Academy of Sciences collection. I believe the record from Somalia is also erroneous.



FIGURES 86–89. Collecting localities of *Pison argentatum* Shuckard. (86) Indian Ocean basin; (87) Australia, New Guinea, and adjacent regions; (88) northwestern Pacific basin; (89) Pacific Ocean.

**RECORDS.—ALDABRA:** no specific locality (Turner, 1911).

**AMERICAN SAMOA:** **Tutuila Island:** Fagatogo (3 ♀, BISH), Leone-Aluau trail (1 ♀, BISH), Pago Pago (1 ♂, BISH), Tafuna (1 ♂, BISH, as Tapuna), Taputimu (2 ♀, 2 ♂, BISH), no specific locality (1 ♀, 1 ♂, BISH).

**AUSTRALIA:** **Australian Capital Territory:** Canberra: Black Mountain (2 ♀, BMNH). **New South Wales:** Blacktown (1 ♀, AMS), 1 km W Eumungerie at 31°56.7'S 148°36.9'E (1 ♂, CAS), Fairfield (4 ♀, AMS), 0.5 km SE Lansdowne near Taree (1 ♂, AMS; 1 ♀, ANIC), Mount Tomah in Blue Mountains (1 ♀, AMS), Quakers Hill (1 ♀, AMS), Whiskers 7 km WNW Hoskinstown at 35°24'S 149°23'E (1 ♀, ANIC). **Northern Territory:** Adelaide River crossing with Daly River Road at 13°29'S 131°04'E (1 ♂, NTM), 48 mi. SW Daly River at 14°11'S 130°08'E (2 ♀, ANIC), Darwin (1 ♀, NTM), Gregory National Park at 16°06.6'S 130°25.7'E (3 ♀, ANIC; 2 ♀, CAS), Keep River National Park at 15°45'30"S 129°06'28"E (1 ♂, ANIC; 1 ♀, 1 ♂, CAS), McArthur River 2 km SSE Borroloola at 16°05'S 136°19'E (1 ♀, ANIC), 16 km NE Mount Cahill at 12°50'S 132°51'E (1 ♀, NTM), Muiarella Park in Kakadu National Park at 12°51'S 132°45'E (1 ♀, ANIC), Springvale 8 km W Katherine (1 ♀, ANIC), Virginia 31 km SE Darwin Central Business District at 12°33'S 131°02'E (1 ♂, NTM). **Queensland:** Almaden (1 ♀, AMS), Amundale, a southwestern suburb of Townsville, at 19°19'S 146°47'E (7 ♀, 2 ♂, NTM), Arcadia on Magnetic Island at 19°09'S 146°52'E (9 ♀, ANIC; 1 ♀, CAS; specimens reared from mud nest), Atherton at 17°17'S 145°29'E (1 ♀, ANIC), 14 mi NW Ayr (1 ♀, CAS), Balgal Beach 51 km NW Townsville at 19°02.5'S 146°25.2'E (2 ♀, CAS), Brisbane (4 ♀, 10 ♂, QMB), Brisbane: Blunder Creek (6 ♀, QMB), Brisbane: Indooroopilly (5 ♀, 4 ♂, BMNH), Bundaberg (3 ♀, 1 ♂, ANIC; 1 ♂, BMNH), Burnett River at Bundaberg (1 ♀, ANIC), Cairns (1 ♂, BMNH; 3 ♀, CAS; 1 ♂, RMNH), Cairns at 16°49'07"S 145°41'13"E (3 ♂, AMNH), Cairns District (2 ♀, 1 ♂, SAM), Cape Hillsborough National Park (1 ♂, QMB), Cockatoo Creek Crossing 17 km NW Heathlands at 11°39'S 142°27'E (1 ♀, ANIC), Cooktown at 15°28.3'S 145°15.5'E (2 ♀, CAS), Davies Creek National Park at 17°00.2'S 145°34.1'E (1 ♀, CAS), 2 km N Davies Creek National Park at 16°58.5'S 145°32.7'E (1 ♀, CAS), 18 km S Dingo Beach at 20°16.0'S 148°31.2'E (1 ♀, CAS), Eurimbula (1 ♀, AMS), 5 km S Gympie (1 ♂, QMB), Homevale National Park at 21°26.9'S 148°32.4'E (4 ♀, 2 ♂, CAS), Innes Park E Bundaberg (1 ♂, ANIC), Kuranda (1 ♀, ANIC; 2 ♀, AMS; 2 ♀, BMNH; 8 ♀, 3 ♂, CAS; 1 ♀, SAM), Kurrimine Beach 30 km S Innisfail at 17°46.6'S 146°06.5'E (2 ♀, 1 ♂, CAS), Mabuag Island in Torres Straits (1 ♀, AMS), Mackay (18 ♀, including lectotype and 4 paralectotypes of *Pison ignavum*, 4 ♂, BMNH), Mareeba (3 ♀, ANIC), Mount Byron area in D'Abguilar Range (1 ♀, QMB), 56 road km WNW Mount Carbine at 16°19.4'S 144°43.2'E (1 ♀, CAS), Mount Webb National Park at 15°04'S 145°07'E (2 ♀, ANIC), Mungumby Lodge near Helenvale (1 ♀, AMS), Old Annandale near Townsville (6 ♀, 1 ♂, NTM), Paluma Range National Park at 18°51.6'S 146°07.6'E (1 ♀, CAS), Pinnacle Creek 27 km N Archer Crossing (2 ♀, 1 ♂, ANIC), Port Douglas (2 ♀, RMNH; 1 ♀, 1 ♂, SAM), Rockhampton (1 ♀, CAS), 2 km N Rokeby at 13°39'S 142°40'E (7 ♀, 2 ♂, ANIC), 61 km S Rolleston at 24°59.7'S 148°27.8'E (1 ♂, CAS), Rowes Bay near Townsville (1 ♀, NTM), South Mission Beach at 17°56'10"S 146°05'41"E (1 ♀, AMNH), Split Rock 14 km SE Laura at 15°39'S 144°31'E (1 ♀, ANIC), Stewart River 5 km W Port Stewart (1 ♀, ANIC), The Bend 3 km NW Coen at 13°56'S 143°12'E (2 ♀, ANIC), Townsville (1 ♀, ANIC; 5 ♀, 4 ♂, SAM), Waverley Creek Rest Area 65 km N Marlborough at 22°26.3'S 149°28.5'E (1 ♀, CAS), Wenlock River at Moreton (1 ♀, ANIC), Wonga Beach 11 km NNE Mossman at 16°19.9'S 145°25.3'E (2 ♀, 2 ♂, CAS), Crail Bay (1 ♀, RMNH). **Victoria:** Gunbower (2 ♀, BMNH), Melbourne (1 ♂, BMNH), 23 mi. E Orbost (1 ♂, CAS). **Western Australia:** Carson escarpment at 14°49'S 126°49'E (1 ♀, ANIC), 4 km W King Cascade at 15°38'S 125°15'E (1 ♀, ANIC).

**COOK ISLANDS:** **Aitutaki Island:** Amuri (1 ♂, BISH). **Rarotonga Island:** Avarua (2 ♂, BISH), Avatiu (3 ♂, BISH), Titikaveka (1 ♂, BISH), and no specific locality (4 ♀, BISH).

**EAST TIMOR:** foot of Mundo Perdido near Ossu (1 ♀, SAM).

**FEDERATED STATES OF MICRONESIA** (Krombein, 1949, 1950; Yasumatsu, 1953, or as indicated): **Chuuk** (as Truk) **Atoll:** Tonowas Island (as Dublon Island), Toloas, Toloas – Erin. **Kusaie Island** (now Kusrae): Lelu, Mwot – Utwe. **Pohnpei Island** (formerly Ponape): Kolonia, as Colonia (2 ♀, 2 ♂, BISH), Ronkiti, Ronkiti-One, Sokehs Peninsula (2 ♀, BISH, as Jokaj). **Yap Island:** Yaptown.

**FIJI:** **Viti Levu:** Colo-i-Suva (1 ♀, BISH, as Tholo-i-Suva), Koronivia (3 ♀, ANIC; 2 ♀, CAS), Lautoka (1 ♀, BISH), Nadi (6 ♀, 2 ♂, BISH, as Nandi), Nanduruloulou (1 ♀, BISH), Raki Raki (1 ♂, BISH), 10 km E Sigatoka (1 ♀, 1 ♂, CAS), Suva (5 ♀, BISH; 1 ♀, 1 ♂, BMNH; 9 ♀, 5 ♂, RMNH). Also from

Williams, 1947: Bua Province: no specific locality, Korovou, Lautoka, Nandarivatu, Rewa Province: no specific locality, Vunidawa.

**FRENCH POLYNESIA** (Cheesman, 1928; Williams, 1932, or as indicated): **Austral Islands**: Rurutu Island: Moeraï (4 ♀, 1 ♂, BISH), Tubuai Island: Mahu (3 ♀, 1 ♂, BISH), no specific locality (2 ♀, BISH). **Huahine Island**: Maeva (1 ♀, BISH). **Marquesas Islands**: Fatu-Hiva: Omoa; Hiva-oo: Atuona, Hanaiapa Valley (18 ♀, BISH); Nuku Hiva: Taichae (3 ♂, BISH), Taiohae, Tovii; Tahuata: Hanamiai Valley, Hanatetena Valley, Vaitahu Village. **Moorea**: Atitia (10 ♀, 4 ♂, CAS), Baie de Cook (2 ♀, BISH). **Raiatea Island**: Uturoa (2 ♂, BISH). **Tahiti**: Papeiti (Yasumatsu, 1953). **Tuamotu Archipelago**: Rangiroa Atoll: Avatoru (1 ♀, BISH),

**HAWAIIAN ISLANDS**: **Kauai**: Waimea (Swezey, 1921). **Maui**: Haleakala (1 ♀, BISH). **Oahu**: Honolulu (5 ♀, 1 ♂, BISH; 1 ♀, CAS), Kalihi (1 ♂, BISH), and no specific locality (6 ♀, 2 ♂, BISH).

**INDIA** (Bingham, 1897): **Uttar-Pradesh** (as North West Provinces, no specific localities).

**INDONESIA**: **Bali**: 9.6 km NW Ubud (1 ♂, CAS). **Halmahera**: between Payahe and Gita Woda (1 ♀, RMNH), Tayawi near Payahe (1 ♀, RMNH). **Java**: Bogor (1 ♀, CAS; 2 ♀, RMNH), Jakarta (8 ♀, 3 ♂, RMNH, as Batavia), Kaliwates (1 ♀, RMNH), Malang (1 ♂, CAS; 2 ♀, RMNH), Samarang (1 ♀, RMNH), Simpang (1 ♀, RMNH), Sindanglaja (12 ♀, RMNH). **Maluku**: Island of Ambon: Waai (18 ♀, BISH; 2 ♂, CAS), no specific locality (2 ♀, CAS; 12 ♀, RMNH). **Seram**: Hatumete 15 km NNE Tehoru at 3°17'S 129°39'E (2 ♂, RMNH). **Sulawesi**: Bogani Nani Wartabone National Park at 0°34'N 123°54'E (1 ♂, RMNH, as Dumoga Bone National Park). **Sumatra**: Bukittingi (Maidl, 1925, as Fort de Kock), Medan Island (1 ♀, RMNH), Palembang (1 ♀, CAS), Sinabang on Simeuluc Island (2 ♀, RMNH), northeast Sumatra: no specific locality (1 ♀, RMNH). **Western Papua** (= Indonesian New Guinea): Bernhard Camp at Taritatu River (1 ♀, 1 ♂, RMNH, as Idenburg River), Hol Maffen 22 km E Sarmi (1 ♀, BISH), Jayapura (8 ♀, 3 ♂, RMNH, mostly as Hollandia), Sentani at 2°40'S 140°30'E (1 ♀, RMNH). **West Timor**: Bipolo: Pariti Forest at 10°01'S 123°49'E (1 ♂, NTM).

**JAPAN**: **Ogasawara** (= Bonin) **Islands**: Anijima Island in Chichijima Group: Southwest Bay (1 ♀, 1 ♂, BISH), Chichijima Island: Omura and no specific locality (2 ♂, BISH), Tatsumi Wan (1 ♂, BISH). **Ryukyu Islands**: Mount Omoto on Ishigaki Island (Evans, 1957).

**KIRIBATI**: **Gilbert Islands**: Banreaba Island (1 ♀, BISH), Tarawa Atoll: Bairiki Island (1 ♀, 12 ♂, BISH) and Teoraake (1 ♀, BISH).

**MADAGASCAR**: no specific locality (1 ♀, MHNG).

**MALAYSIA WEST**: **Perak**: Parit Buntar (Pagden, 1934). **Sabah**: Forest Camp 19 km N Kalabakan (1 ♀, BISH), Forest Camp 9.8 km SW Tenom (1 ♀, BISH), Kennedy Bay (1 ♀, CAS), Koh Bersatu Estate 115 km W Sandakan at 5°42'N 117°09'E (Starr, 2004), Kota Kinabalu (1 ♀, as Jesselton, 1 ♂ CAS), Singkor (2 ♀, BISH), Tuaran (2 ♀, 2 ♂, CAS), Ulu Dusun mile 30 on Labuk Road (1 ♂, CAS). **Selangor**: Dusun Tua in Hulu Langat area (3 ♀, RMNH, as Ulu Langat), Kuala Lumpur (Pagden, 1934), Seri Kembangan (Pagden, 1934, as Serdang).

**MALAYSIA EAST**: **Sabah**: Kalabakan River 48 km W Tawau (1 ♀, BISH), Singkor (1 ♂, BISH).

**MARIANA ISLANDS**: **Guam** (Swezey, 1942; Krombein, 1949, or as indicated): Merizo, Nimitz Beach (1 ♀, BISH), Piti, Pago, Talofofo. **Saipan Island**: As Mahetog (1 ♂, BISH), no specific locality (5 ♂, BISH).

**MARSHALL ISLANDS** (Yasumatsu, 1935 or as indicated): Ine Island: Arno Atoll (1 ♀, BISH), Jaluit Atoll, Wotje Atoll.

**MAURITIUS**: no specific locality (Shuckard, 1838).

**MYANMAR** (as Burma, including Tenasserim): no specific locality (Bingham, 1897), but Rangoon and Kyaikkami (as Amherst) according to Turner, 1916).

**NEW CALEDONIA**: no specific locality (Callan, 1990; Jennings, Krogmann, and Burwell, 2013). **Grande Terre**: Hienghène (1 ♀, BISH), La Coulée (1 ♂, BISH), La Foa (1 ♂, BISH), Mouriance Pass (1 ♂, BISH), Nakale River (1 ♀, BISH), Nouméa (1 ♀, 8 ♂, BISH), 25 mi NW Nouméa (Williams, 1945), Ouégoa (1 ♀, UCD), Touho (1 ♀, UCD), Saint Louis (Williams, 1945), NE Yambi (1 ♀, BISH).

**PALAU REPUBLIC**: Koror (2 ♀, 1 ♂, BISH; 1 ♀, CAS).

**PAPUA NEW GUINEA**: **Madang Province**: Brahman Catholic Mission at 6°45'S 145°23'E (1 ♂, CAS), Erima (1 ♂, MTM, determined as *ignavum* by Tsuneki), Nagada Harbor 8 km N Madang at 5°09'S 145°48'E (24 ♀, 24 ♂, CAS), Nobonob Hill 7 km N Madang at 5°10'S 145°45'E (1 ♂, CAS). **Morobe Province**:



Lae (1 ♀, BISH). **National Capital District:** Boroko – a southern suburb of Port Moresby (1 ♂, BISH), Port Moresby (13 ♀, 8 ♂, CAS), Waigani, a suburb of Port Moresby (2 ♀, UCD). **New Britain:** Rabaul (1 ♀, BISH). **New Ireland:** Lavongai Island: Banatam (Tsuneki, 1982). **Western Province:** Daru Island (1 ♀, BISH).

**PHILIPPINES:** **Cebu:** (Tsuneki, 1983a): Argao, Cantabaco Mactan Island near Cebu. **Leyte:** (Tsuneki, 1983a; Starr, 2004): Baas at 10°22'N 124°45'E, Basey, near Baybay at 10°45'N 124°47'E, Palo (2 ♀, BISH), Tacloban. **Luzon:** (Turner, 1916; Tsuneki, 1983a; Balthasar, 1966, or as indicated), Bacoor, Baguio, Baso, Bontoc, Cavite, Ifugao (1 ♀, BISH), Los Baños (1 ♂, CAS), Manila, Muñoz (1 ♂, CAS), Naga City, Naguilian, Pagsanjan, Tabaco, Tanay in Rizal Province (1 ♂, BISH). **Mindanao:** (Tsuneki, 1983a, Starr, 2004): Busco at 8°16'N 124°58'E, Cagayan de Oro, Davao, Malaybalay, Zamboanga. **Mindoro:** San Jose (2 ♀, CAS). **Negros:** Taytay beach (Tsuneki, 1983a). **Palawan:** (Starr, 2004, Haneda, 2011, or as indicated): near Aborlan at 9°26'N 118°33'E, Iwahig, Puerto Princesa, 3 km NE Tinabog (1 ♀, BISH). **Samar:** Basey (Tsuneki, 1983a). **Tawi Tawi:** Tarawakan (Tsuneki, 1976).

**RÉUNION:** no specific locality (de Saussure, 1892; Bordage, 1912; Kohl in Bordage, 1912).

**SAMOA:** **Upolu Island:** Apia (2 ♂, BISH), Mulinu'u (1 ♂, BISH).

**SEYCHELLES:** (Vesey-Fitzgerald, 1956; Madl, Matyot, and Schödl, 1996): **Mahé Island:** Anse Bougainville (1 ♀, RMNH), Baie Lazare (1 ♀, NHMW), Glacis Village (3 ♀, RMNH), northeast point (1 ♀, RMNH), Port Glaud (1 ♀, NHMW), Val d'Endor. **Praslin Island:** near Pasquiére River. **Silhouette Island:** La Passe (2 ♀, NHMW).

**SINGAPORE:** Singapore (10 ♀, 2 ♂, CAS).

**SOLOMON ISLANDS:** **Ghizo Island:** Gizo (1 ♂, BISH). **Russell Islands:** Pavuvu (1 ♀, CAS).

**SOUTH KOREA:** Chojusan (Yasumatsu, 1939, a Japanese name, current name unknown).

**SRI LANKA:** **Western Province:** Colombo (1 ♂, CAS).

**TAIWAN:** **Pingtung County:** Fangliao (Tsuneki, 1967), Paoli (Tsuneki, 1971).

**THAILAND:** **Bangkok:** Bangkok (1 ♂, BISH). **Chieng Mai:** Chieng Mai (Tsuneki, 1963). **Nakhon Nayok:** Ban Na (1 ♀, BISH). **Pathum Thani:** Rangsit Rice Experimental Station (Iwata, 1964). **Saraburi:** Saraburi (Tsuneki, 1963). **Songkhla:** Songkhla (2 ♀, CAS). **Wang Saphung:** Loei (1 ♀, CAS).

**TONGA:** **Tongatapu Island:** Nukualofa (2 ♀, BISH). **Vavau Island:** Neiafu (2 ♀, 1 ♂, BISH).

### *Pison argentifrons* Pulawski, species nova

Figures 90-98.

**NAME DERIVATION.**— *Argentifrons* is derived from two Latin words, *argentum*, *silver*, and *frons*, a noun in apposition to the generic name; with reference to the silvery frons setae that differentiate this species from the female of *Pison auriventre*.

**RECOGNITION.**— *Pison argentifrons* is an all black species except for the ferruginous mandible and apical depressions of terga, with appressed setae on tergum I and the scape inflated in lateral view (as in Fig. 155). The female is characterized by the presence of a short psammophore on the lower gena (longest setae about  $0.5 \times$  greatest forefemoral width), the ocellocular distance smaller than the interocellar distance, the integument practically impunctate and asetose between the psammophore and the oral fossa, and the clypeal lamella obtusely angulate, with an obtuse but well-defined corner on each side (the distance between the corners is greater than the distance between a corner and the adjacent orbit); the setae on the forefemoral venter are erect, but not forming a real psammophore. It is closely similar to *Pison auriventre*, but unlike that species it has the scutal punctures less than one diameter apart (rather than contiguous), tergum VI narrower (compare Figs 93 and 159), and the frontal setae silvery (golden in many females of *auriventre*).

The male has the clypeal lamella acutely to slightly obtusely angulate; the dorsal length of flagellomere I  $1.8 \times$  apical width; tergum VII usual (without translucent apical lamella); punctures of sterna III-VI averaging about 1-3 diameters apart mesally; a rounded or truncate apically sternum VIII, without posterolateral corner and with a prominent subbasal convexity (Figs. 94, 95),

combined with closely, finely punctate sternum VII. It resembles *Pison auriventre*, but unlike that species it has the flagellum cylindrical (rather than flagellomeres III-VI expanded apicoventrally) and the scutal punctures less than one diameter apart (rather than contiguous).

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Labrum not emarginate. Scape inflated in lateral view (see Fig. 155). Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart; interspaces finely microsculptured, dull (Fig. 92). Tegula elongate. Mesopleural punctures superficial, less than one diameter apart in female, contiguous in male; interspaces markedly microsculptured. Postspiracular carina about as long as midocellar diameter. Mesopleuron adjacent to metapleuron and propodeal side adjacent to metapleuron below dorsal pit with conspicuously foveolate sulcus. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, punctate between ridges; side ridged, punctate between ridges; posterior surface irregularly ridged, punctate between ridges. Hindcoxal dorsum with outer margin not carinate or carinate only apically. Punctures of horizontal portion of tergum I minute in female, fine in male, averaging less than one diameter apart. Sterna uniformly, densely punctate throughout, but sternum II with punctures averaging mesally 2-3 diameters apart in female, 1-3 diameters apart in male.

Setae silvery on head, thorax, and propodeum, in most specimens golden on gaster; on upper frons one part of setae erect, another part appressed, oriented dorsally between midfrontal carina and midocellus; appressed on scutum and tergum I; see below for setae of lower gena; completely concealing integument on clypeus (except lamella).

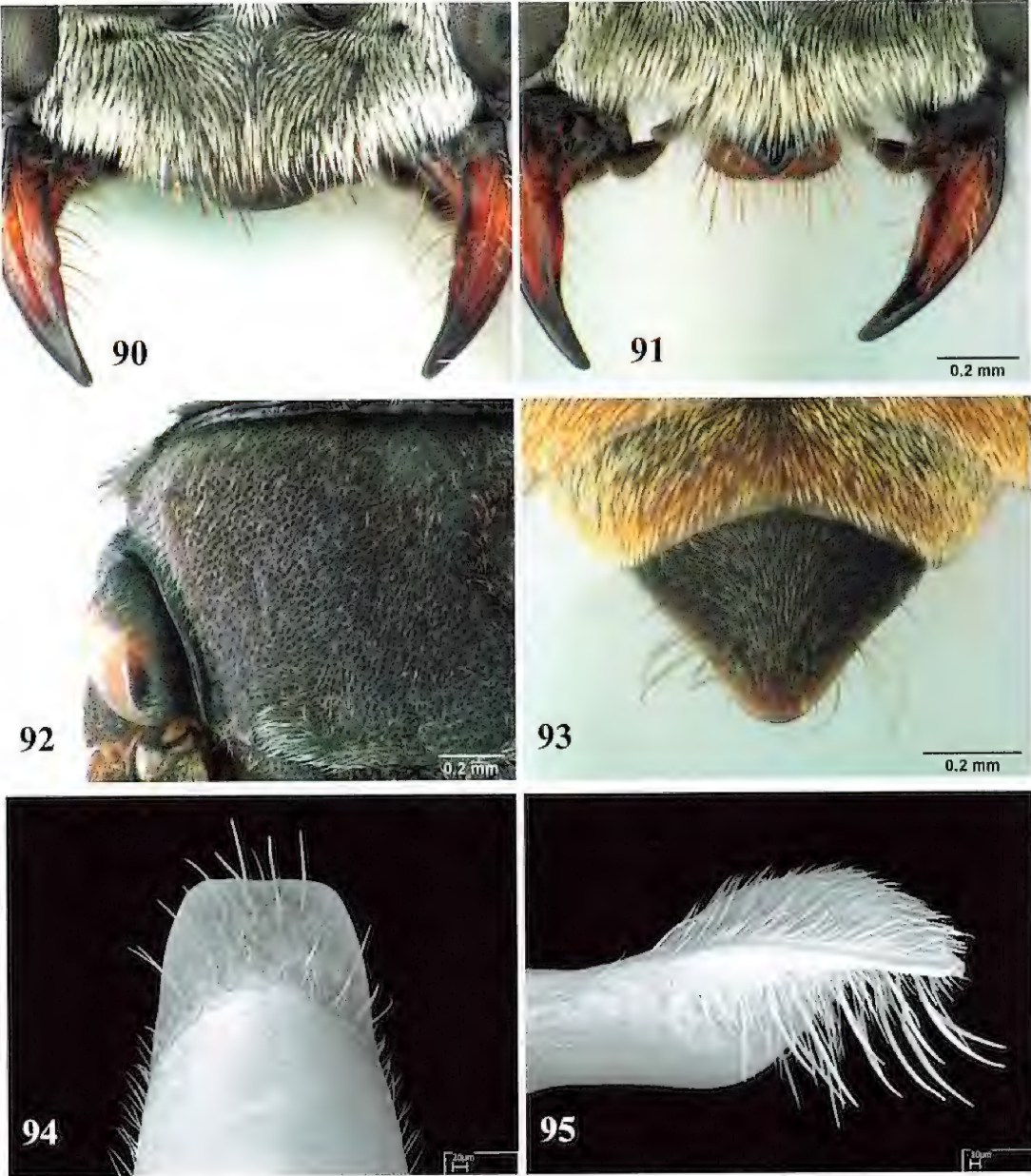
Body black, mandible ferruginous mesally, apical depressions of terga ferruginous.

♀.—Upper interocular distance equal to  $0.64-0.66 \times$  lower interocular distance; ocellocular distance equal to  $0.8-1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5-1.6 \times$  hindocellar diameter; eye height equal to  $1.14-1.20 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 90). Labrum transverse. Dorsal length of flagellomere I  $1.7-1.9 \times$  apical width, of flagellomere IX  $1.3-1.4 \times$  apical width. Lower gena and mandibular posterior margin with psammophores (longest setae of genal and mandibular psammophores about  $0.5 \times$  and  $0.7 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophore, at most with a few sparse punctures and associated setae; forefemoral venter with erect setae up to about one midocellar diameter long that do not form psammophore. Mandible: trimmal carina with small incision at about midlength. Tergum VI pointed (Fig. 93). Length 6.7-8.8 mm; head width 2.2-2.3 mm.

♂.—Upper interocular distance equal to  $0.74-0.80 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.7-1.8 \times$  hindocellar diameter; eye height equal to  $1.16-1.20 \times$  distance between eye notches. Free margin of clypeal lamella acutely to slightly obtusely angulate (Fig. 91). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Lower gena, on each side of oral fossa, either sparsely or densely punctate; setae suberect, slightly sinuous, up to one midocellar diameter long. Sternum VII finely, closely punctate. Sternum VIII with unsculptured swelling subbasally (Fig. 95), densely punctate between swelling and apical margin, which is rounded or truncate (Figs. 94). Genitalia: Figs. 96, 97. Length 6.3-7.7 mm; head width 1.9-2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 98).—Australian Capital Territory, New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**—HOLOTYPE: ♂, AUSTRALIA: New South Wales: 4 km W Sunny Corner at  $33^{\circ}22.7'S$



FIGURES 90–95. *Pison argentifrons* Pulawski, sp. nov. (90) Female clypeus and mandibles; (91) Male clypeus and mandibles; (92) Female tegula and adjacent scutum; (93) Apex of female gaster; male; (94) Sternum VIII (ventral surface); (95) Sternum VIII in lateral view;





FIGURES 96–98 *Pison argentifrons* Pulawski, sp. nov., male. (96) Genitalia in dorsal view; (97) Genitalia in lateral view.

FIGURE 98. Collecting localities of *Pison argentifrons* Pulawski, sp. nov.



149°51.6'E, 11 Dec 2009, V. Ahrens and W.J. Pulawski (AMS).

PARATYPES: **AUSTRALIA: Australian Capital**

**Territory:** Black Mountain at 35°16'S 149°06'E, 4–17 Feb 1080, D.H. Colless (1 ♀, ANIC), Aug – Oct 1982, I.D. Naumann and J.C. Cardale (1 ♀, ANIC), 3 Apr 1984, D.B. McCorquodale (1 ♀, ANIC), 2 Jan 1987, I.D. Naumann (1 ♀, ANIC), 11–17 Dec 1987, M.E. Irwin (1 ♂, CAS), and 8 Jan 1988, M.E. Irwin (1 ♀, UCD); Canberra, 27 Feb 1984, D.B. McCorquodale (1 ♀, ANIC) and E.McC. Callan, 5 Dec 1974 (1 ♀, ANIC) and 9 Mar 1983 (1 ♀, ANIC). **New South Wales:** same locality and collectors as holotype, 7 Dec 2009 (2 ♀, 14 ♂, CAS), 10 Dec 2009 (1 ♀, 4 ♂, CAS), 11 Dec 2009 (3 ♀, 1 ♂, CAS); Braidwood: Shoalhaven bridge, 12 Dec 1984, D.B. McCorquodale (1 ♀, ANIC); Burrendong Botanic Garden at 32°42.1'S 149°06.2'E, 13 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♀, 1 ♂, CAS); Kinchega National Park at 32°22.8'S 142°23.6'E, V. Ahrens and W.J. Pulawski, 17 Dec 2011 (1 ♀, CAS), 18 Dec 2011 (1 ♀, CAS), and 19 Dec 2011 (3 ♀, CAS); Mookerawa Waters Park 6 km NE Stuart Town at 32°46.0'S 149°09.8'E, 12 Dec 2009, V. Ahrens and W.J. Pulawski (3 ♀, CAS); Nerriga, 18 Dec 1984, D.B. McCorquodale (2 ♀, 3 ♂, ANIC); Orange Botanic Gardens at 33°15.3'S 149°05.7'E, 9 Dec 2009, V. Ahrens and W.J. Pulawski (3 ♀, 3 ♂, CAS); Shoalhaven River via Braidwood, 2 Jan 1987, I.D. Naumann (1 ♀, ANIC); Whiskers 7 km WNW Hoskinstown at 35°24'S 149°23'E, M.S. Upton, 14 Jan 1993 (1 ♀, ANIC) and 1 Apr 1993 (1 ♀, ANIC). **Northern Territory:** 32 km WNW Alice Springs at 23°36'S 133°35'E, 8 Oct 1978, J.C. Cardale (1 ♀, ANIC); Todd River 9 km NE Alice Springs at 23°38'S 133°53'E, 10 Oct 1978, J.C. Cardale (1 ♀, ANIC). **Queensland:** Brisbane: Blunder Creek, 11 Nov 1979, H.E. Evans (2 ♀, QMB); Dipperu National Park at 21°53.9'S 148°46.5'E, 2 Nov 2012, V. Ahrens and W.J. Pulawski (3 ♀, 2 ♂, CAS); Dynevor Lakes at 28°05'S 144°12'E, 26 Oct 1991, G. Daniels (1 ♀, QMB), Heathlands at 11°45'S 142°35'E 15–16 Jan 1992, I.D. Naumann and T. Weir (1 ♀, ANIC); Homevale National Park at 21°26.9'S 148°32.4'E, V. Ahrens and W.J. Pulawski, 27 Nov 2012 (1 ♂, CAS), 28 Nov 2012 (2 ♀, 1 ♂, CAS). **South Australia:** 5 km S Mylor, A.D. Austin, 27 Dec 1980 (1 ♂, BMNH) and 31 Jan 1981 (1 ♀, 1 ♂, BMNH); 79 km NNW Renmark at 33°31'S 14°24'E, K.R. Pullen, 10 Oct – 9 Nov 1995 (1 ♂, ANIC) and 11 Oct – 9 Nov 1995 (1 ♂, ANIC); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, V. Ahrens and W.J. Pulawski, 26 Jan 2011 (1 ♀, CAS) and 27 Jan 2011 (1 ♀, 1 ♂, CAS). **Tasmania:** Hobart, 30 Aug 1933, C.E. Cole (1 ♀, SAM). **Western Australia:** Albany, 29 Nov 1979, R.M. Bohart (1 ♂, UCD); Gingin, 3 Nov 1979, R.M. Bohart (2 ♀, 2 ♂, UCD); Moora, 6 Nov 1979, R.M. Bohart (1 ♀, 4 ♂, UCD); Serpentine Falls, 20 Jan 1971, G.A. Holloway (1 ♀, AMS).

*Pison argyrotrichum* Pulawski, species nova

Figures 99-107.

**NAME DERIVATION.**— *Argyrotrichum*, a composite of two Greek words: ἀργυρός, *silver*, and θρίξ, *of hair*, from θρίξ, *a hair*; with reference to the silvery scutal setae of this species.

**RECOGNITION.**— *Pison argyrotrichum*, known from one male only, is an all black species, with the setae silvery on the scutum and erect on tergum I, and sterna III and IV with a few, sparse punctures on each side of midline. It is further characterized by the following character combination: mesopleural punctures less than one diameter apart; punctures of upper frons well defined, about  $0.1-0.2 \times$  midocellar diameter; posterior mandibular margin gradually curving toward apex (not step-like); inner mandibular margin simple (not tridentate or bidentate apically); tergal setae silvery; dorsal length of flagellomere I  $2.3 \times$  apical width. The species closely resembles *P. rarum* (known from the female sex only), but differs as follows: in *P. argyrotrichum*, several admedian punctures of the scutum anteriorly are more than one diameter apart (Fig. 102), and the punctures on the scutellum are about as sparse as most punctures on the scutum, whereas in *P. rarum* the punctures in the anterior half of the scutum are no more than one diameter apart, and the punctures of the scutellum are sparser than most punctures on the scutum.

**DESCRIPTION.**— Frons dull, with well defined punctures that are less than one diameter apart. Occipital carina joining hypostomal carina. Gena relatively narrow in dorsal view (Fig. 100). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $3.0 \times$  as long as midocellar diameter. Scutum not foveate along flange, with short, irregular longitudinal ridges adjacent to posterior margin; scutal punctures well defined, mostly less than one diameter apart, but several admedian punctures anteriorly more than one diameter apart (Fig. 102). Scutellum with punctures about as sparse as those on scutum. Tegula somewhat enlarged. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, punctate between ridges; side ridged, punctate between ridges; posterior surface ridged, with several ridges radiating up from transverse carina just above gastropodeal articulation. Posteroventral forefemoral surface with well defined punctures; several punctures more than one diameter apart. Punctures of tergum I well defined, about 1-2 diameters apart on horizontal portion mesally anterior of apical depression, averaging more than one diameter apart on basal declivity. Sternum II sparsely punctate apicomesally; sterna III and IV with a few, fine punctures on each side of midline, denser laterally (Fig. 103).

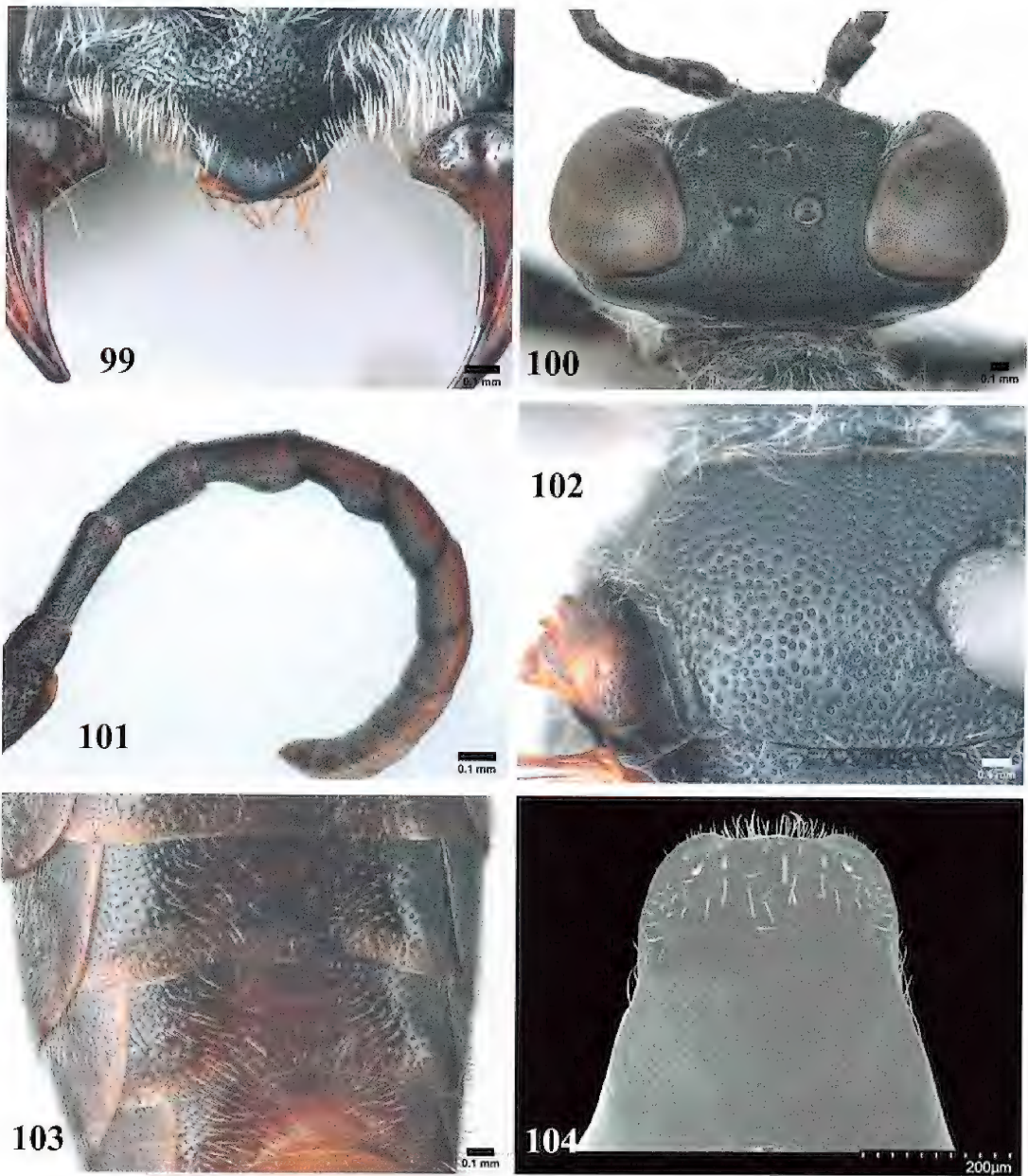
Setae silvery, erect on postocellar area, thorax, forecoxal venter, femoral venters, and tergum I; on lower gena sinuous, up to  $2.5 \times$  midocellar diameter; in single specimen examined clypeal setae missing mesally, but concealing integument laterally. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Unknown.

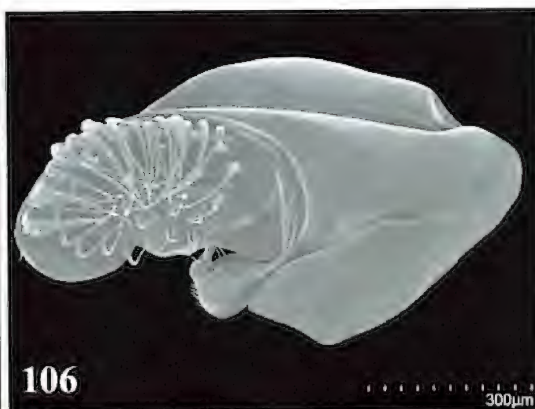
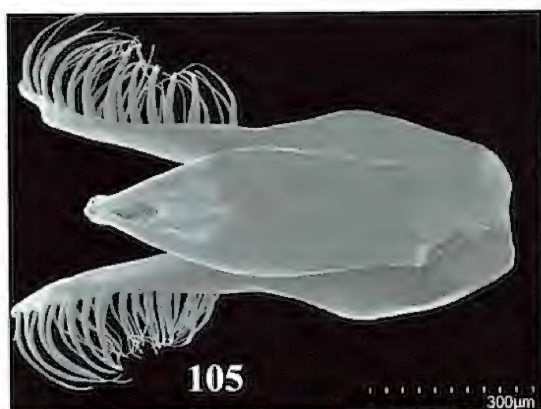
♂.— Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate, somewhat prominent (Fig. 99). Flagellomeres III and IV concave basoventrally, convex apicoventrally (Fig. 101). Dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Apical margin of sternum VIII minimally, broadly emarginate, almost straight (Fig. 104). Genitalia: Figs. 105, 106. Length 8.0 mm; head width 2.5 mm.





FIGURES 99–104, *Pison argyrotrichum* Pulawski, sp. nov., male. (99) Clypeus and mandibles; (100) Head in dorsal view; (101) Flagellum showing emarginate ventrally flagellomeres III and IV; (102) Tegula and adjacent scutum; (103) Sterna III–V in slightly oblique view; (104) Sternum VIII (ventral surface).





FIGURES 105–106. *Pison argyrotichum* Pulawski, sp. nov., male. (105) Genitalia in dorsal view; (106) Genitalia in lateral view.

FIGURE 107. Collecting locality of *Pison argyrotichum* Pulawski, sp. nov.

**GEOGRAPHIC DISTRIBUTION** (Fig. 107).—Known from one locality in Western Australia.

**RECORDS.**—HOLOTYPE: ♂, AUSTRALIA: Western Australia: 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E, 24 Apr – 7 May 2003, M.E. Irwin and F.D. Parker (ANIC).

***Pison aridum* Pulawski, species nova**

Figures 108–118.

**NAME DERIVATION.**—*Aridus* (neuter: *aridum*), Latin adjective meaning *dry, parched, arid*; with reference to this species dry habitat.

**RECOGNITION.**—*Pison aridum* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. Additionally, it has a longitudinal carina separating the propodeal side from the dorsum and posterior surface, the setae of the lower gena straight (curved apically) and short (about as long as  $0.5 \times$  midocellar diameter), the head, thorax, propodeum, and gaster black, while most of the femora and the entire tibiae and tarsi are ferruginous. The female resembles *P. protrudens*, but differs in having a tridentate clypeal lamella (Figs. 108, 109). The male resembles *P. translucens* in having the apical portion of tergum VII yellowish (except mesally). It differs from that species in having the genal setae straight, shorter than midocellar diameter (rather than sinuous, as long as  $1.0\text{--}1.2 \times$  midocellar diameter), and in having the posterior margin of the black, sclerotized portion of tergum VII (adjacent to the yellowish portion) acutely angulate (Fig. 114), rather than broadly, obtusely tridentate (Fig. 1128). Also, the apical emargination of sternum VIII is unusually narrow (the distance between its apico-lateral corners is about  $0.25 \times$  the sternum maximum width, the apical margin convex between the corners) and, in most specimens, the surface of tergum VII is concave on each side of the black, median part.

**SEX ASSOCIATION.**—The male described below is associated with the females of *P. aridum*

(rather than with those of *P. adnyamathanha*), because both sexes lack the erect setae on the postocellar area and the scutum, whereas such setae are present in *P. adnyamathanha*.

**DESCRIPTION.**—Frons slightly swollen above antennal sockets, finely punctate, punctures less than one diameter apart, interspaces slightly shiny. Labrum not emarginate. Anteromedian pronotal pit round, about as wide as  $0.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula enlarged, with outer margin minimally concave, in some specimens reaching level of axilla. Mesopleural punctures fine, less than one diameter apart. Postspiracular carina present, up to about twice as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, punctures less than one diameter apart (sculpture partly concealed by vestiture); side finely punctate and minutely ridged; posterior surface transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of horizontal part of tergum I minute, less than one diameter apart. Sterna closely punctate throughout.

Setae silvery, appressed on upper frons, postocellar area, scutum, and tergum I, oriented ventrally on upper frons; on lower gena suberect, straight except curved apically, about as long as  $0.5 \times$  midocellar diameter; completely concealing integument on clypeus (except lamella). Apical depressions of terga with setal fasciae; fasciae silvery on terga I and III, with golden tinge on terga III-V.

Head, thorax, propodeum, and gaster black; mandible dark ferruginous, black basally and apically; apical depressions of terga brown. Forefemur black, ferruginous apically, midfemur ferruginous except black basally, hindfemur all ferruginous; tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $1.00 \times$  lower interocular distance; ocellular distance equal to  $1.4\text{--}1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.6 \times$  hindocellar diameter (Fig. 110); eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella tridentate (Figs. 108, 109). Dorsal length of flagellomere I  $1.8\text{--}2.1 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina with incision at about two thirds of length, with small tooth at proximal margin of incision (Figs. 108, 109). Tergum VI pointed, broad (Fig. 113). Length 9.2–10.3 mm; head width 2.5–2.7 mm.

♂.—Upper interocular distance equal to  $0.90\text{--}1.04 \times$  lower interocular distance; ocellular distance equal to  $1.2\text{--}2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.7 \times$  hindocellar diameter (Fig. 112); eye height equal to  $0.88\text{--}1.00 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 111). Dorsal length of flagellomere I  $1.9\text{--}2.0 \times$  apical width, of flagellomere X  $1.1\text{--}1.2 \times$  apical width. Tergum VII, in most specimens, with shallow, broad concavity on each side; concavities separated by black, narrow central part (Fig. 114). Posterior margin of sternum VII broadly emarginate; sternum VIII with apical emargination unusually narrow, distance between its apicolateral corners measuring about  $0.25 \times$  of maximum width of sternum (Fig. 115); apical margin convex between corners. Genitalia: Figs. 116, 117. Length 7.3–8.7 mm; head width 2.4–2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 118).—New South Wales, South Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: New South Wales: Kinchega National Park at  $32^{\circ}30'S$   $142^{\circ}20'E$ , Jan 1987, K. Henle (ANIC).

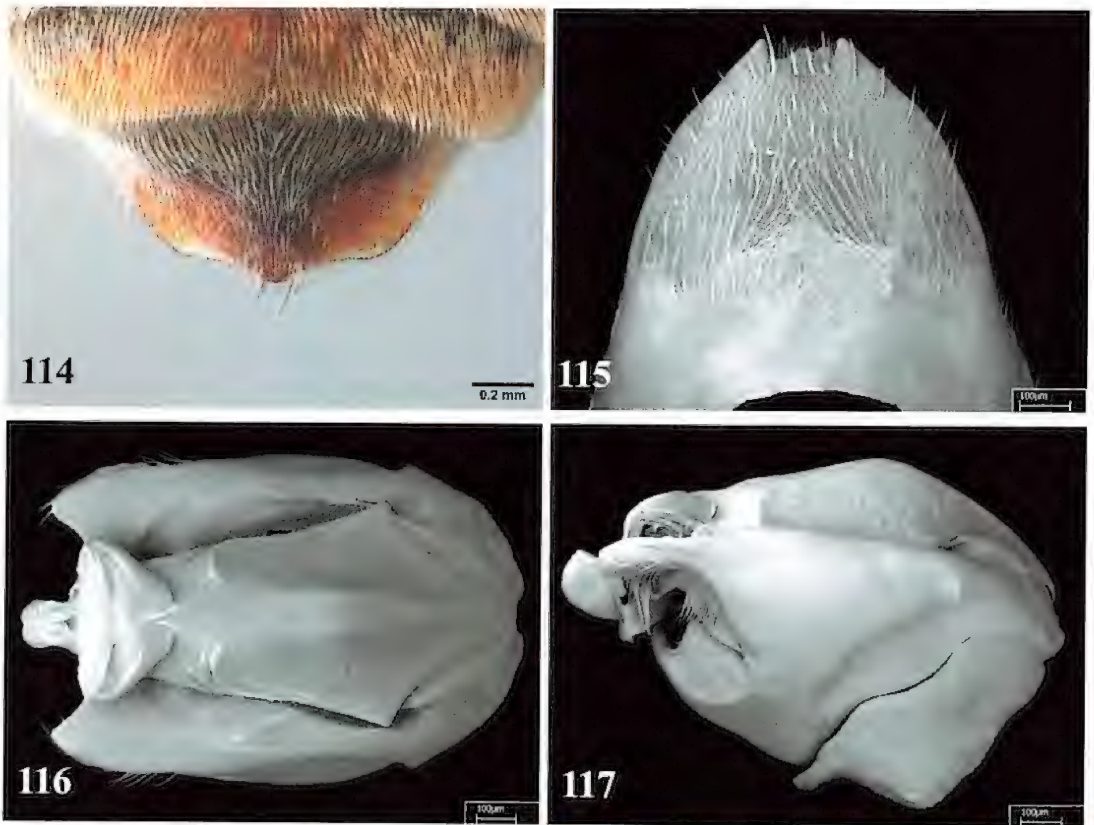
PARATYPES: AUSTRALIA: New South Wales: 13 mi. N Broken Hill, 3 April 1963, K. Dansie (1 ♂, SAM); Fowlers Gap Research Station at  $31^{\circ}05'S$   $141^{\circ}42'E$ , 29 Nov – 2 Dec 1981, J.C. Cardale (3 ♂, ANIC; 1 ♂, CAS), I.D. Naumann (1 ♂, ANIC), I.D. Naumann and J.C. Cardale (1 ♀, ANIC), 18–20 Jan 1999, J. Carpenter and A. Davidson (1 ♂, AMNH); Paroo Darling National Park at  $30^{\circ}51.9'S$   $143^{\circ}05.5'E$ , 14 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); 5 km E White Cliffs at  $30^{\circ}51.2'S$   $143^{\circ}08.7'E$ , 1 Jan 2010, V. Ahrens





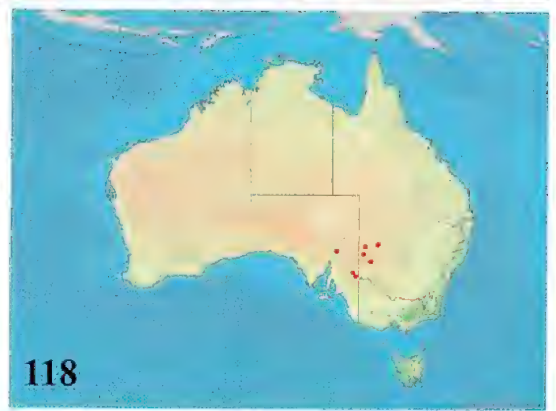
FIGURES 108–113. *Pison aridum* Pulawski, sp. nov. (108) Female clypeus and mandibles; (109) Middle clypeal section of female; (110) Female head in dorsal view; (111) Male clypeus and mandibles; (112) Male head in dorsal view; (113) Female tergum VI.





FIGURES 114–117. *Pison aridum* Pulawski, sp. nov., male. (114) Male tergum VII; (115) Sternum VIII (ventral surface); (116) Genitalia in dorsal view; (117) Genitalia in lateral view.

FIGURE 118. Collecting localities of *Pison aridum* Pulawski, sp. nov.



and W.J. Pulawski (1 ♂, CAS). **South Australia:** 32 km N Renmark at 33°53'S 140°44'E, 12 Dec 1995 – 25 Jan 1996, K.R. Pullen (1 ♂, ANIC); 79 km NNW Renmark at 33°31'S 140°24'E, 12 Dec 1995 – 25 Jan 1996, K.R. Pullen (1 ♂, ANIC); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, 26 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS).

***Pison aterrimum* Pulawski, species nova**

Figures 119–131.

**NAME DERIVATION.**– *Aterrimum* is the superlative of the Latin neuter adjective *atrum*, *black*, meaning *the most black*; with reference to this species coloration.

**RECOGNITION.**– *Pison aterrimum* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It can be recognized by the setae all black on the frons (except lateroventrally), thorax, propodeum, femora, and gaster (the terga without setal fasciae on the apical depressions), wings conspicuous-

ly darkened, almost black (Fig. 125), many scutal punctures 2-3 to several diameters apart, and the propodeal dorsum without ridges, with punctures more than one diameter apart (except laterally). In the female, the gena is impunctate and asetose on each side of the oral fossa, the asetose area bordered by a psammophore (a psammophore is also present on the outer margins of the propleuron and the forecoxa and on the ventral margin of the forefemoral venter). In the male, the apical margin of sternum VIII is not emarginate (Fig. 129).

**DESCRIPTION.**—Frons dull, shallowly punctate, punctures averaging about one diameter apart, less than one diameter apart below midocellus (Fig. 121). Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 122). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, well defined, most of them 2-4 diameters apart, but several punctures one diameter apart or less (Fig. 123); interspaces aciculate, shiny. Tegula enlarged. Mesopleural punctures well defined, less than one diameter apart at center, about one diameter apart posteroventrally in some specimens. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus not costulate or minimally costulate between dorsal and ventral metapleural pits. Propodeum with or without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (in last case, carina replaced by series of short, transverse ridges); dorsum with fine transverse ridges along midline, with well-defined punctures that average more than one diameter apart, but less than one diameter apart along lateral margin (Fig. 124); side with well-defined punctures that are less than one diameter apart, interspaces merging into longitudinal ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface with fine but well-defined punctures that average 2-3 diameters apart. Punctures of tergum I well defined, averaging 2-3 diameters apart. Sternum II punctate except apicomediaally, punctures well defined, averaging 2-3 to several widths apart medially.

Setae black except silvery on clypeus (black mesally) and on frons lateroventrally, erect and sinuous on frons and gena, erect or appressed on scutum, appressed on tergum I; not concealing integument on clypeus; setal length about  $1.0 \times$  midocellar diameter on frons, up to  $2.5 \times$  midocellar diameter on lower gena. Apical depressions of terga without setal fasciae (Fig. 126).

Body all black; wings almost black, with violet tinge (Fig. 125).

♀.—Upper interocular distance equal to  $0.58\text{--}0.60 \times$  lower interocular distance; ocellocular distance equal to  $0.7\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 119). Dorsal length of flagellomere I  $3.0 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.75 \times$ ,  $0.5 \times$ , and  $1.0 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophore. Mandible: trimmal carina with minute incision at about midlength. Tergum VI with median carina apically. Length 6.3-8.8 mm; head width 2.5-2.9 mm.

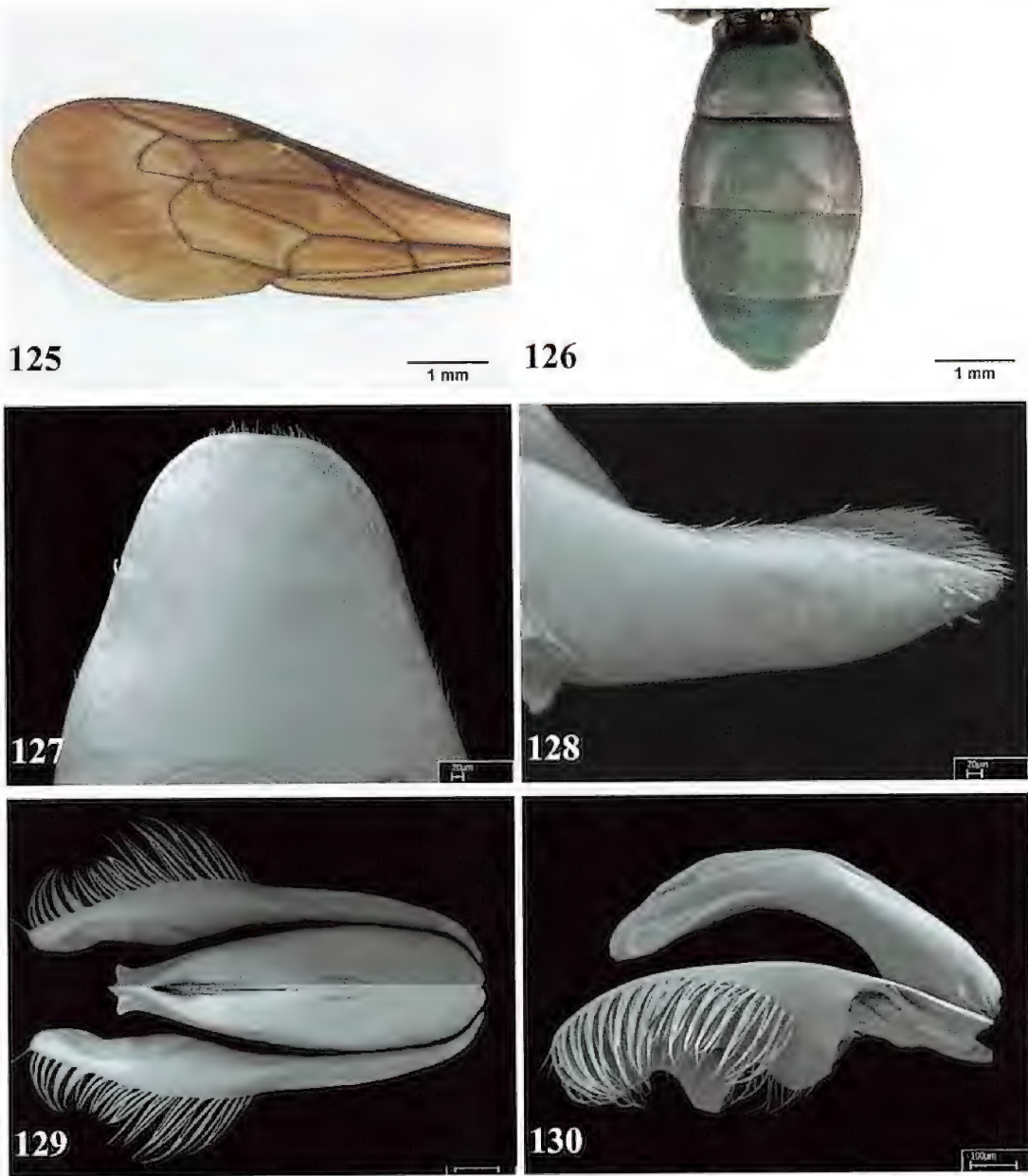
♂.—Upper interocular distance equal to  $0.90 \times$  lower interocular distance; ocellocular distance equal to  $1.3\text{--}1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.6 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}0.98 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 120). Dorsal length of flagellomere I  $2.5\text{--}2.8 \times$  apical width, of flagellomere X  $1.1\text{--}1.2 \times$  apical width. Sternum VIII impunctate except next to apical margin; apical margin rounded (Figs. 127, 128). Genitalia: Figs. 129, 130. Length 7.3-9.2 mm; head width 2.4-2.8 mm.





FIGURES 119–124. *Pison aterrimum* Pulawski, sp. nov. (119) Female clypeus and mandibles; (120) Male clypeus and mandibles; (121) Upper frons of female; (122) Female head in dorsal view; (123) Female tegula and adjacent scutum; (124) Propodeal dorsum of female.





FIGURES 125–130. *Pison aterrimum* Pulawski, sp. nov. (125) Female forewing; (126) Female gaster in dorsal view; male; (127) Sternum VIII (ventral surface); (128) Sternum VIII in lateral view; (129) Genitalia in dorsal view; (130) Genitalia in lateral view (damaged specimen).

**GEOGRAPHIC DISTRIBUTION** (Fig. 131).—  
New South Wales, Western Australia.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **West-**  
**ern Australia:** 186 km ESE Bromme at 18°53'S  
123°43'E, 10 Aug 1976, I.F.B. Common (ANIC).

**PARATYPES:** **AUSTRALIA:** **New South Wales:**  
100 km SE Broken Hill at 32°51'S 141°37'E, 3-13  
Oct 1988, E.D. Edwards (1 ♀, CAS; 1 ♂, ANIC).  
**Western Australia:** Lake Cohen and vicinity at  
24°26'E 125°05'E, 1 Aug 1983, T.F. Houston and  
R.P. McMillan (1 ♂, WAM); 2 mi S Maya, 3 Nov  
1968, N. McFarland (1 ♀, SAM); Youanmi at  
28°37'S 118°50'E, 13 Oct 1974, A.M. and M.J.  
Douglas (1 ♀, WAM).



FIGURES 131. Collecting localities of *Pison aterrimum*  
Pulawski, sp. nov.

### *Pison auratum* Shuckard

Figures 132-141.

*Pison auratum* Shuckard, 1838:78, ♀ (as *auratus*, incorrect original termination). Lectotype: ♀, "South Africa, Cape Province": no specific locality, actually Australia (BMNH), **present designation**, examined. — F. Smith, 1956:314 (in catalog of Hymenoptera in British Museum), 1869:290 (in checklist of *Pison*); Kohl, 1885:186 (in checklist of world *Pison*); Froggatt, 1892:216 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:710 (in catalog of world Hymenoptera); Turner, 1916b:599 (in key to Australian *Pison*), 614 (comparison with *Pison aureosericeum*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Naumann, 1983:149 (Australia; nesting habits); Cardale, 1985:257 (in catalog of Australian Sphecidae); Naumann, 1993:184 (Australia: Queensland: Heathlands area in Cape York); D. Baker, 1998:173 (origin and depository of type material); Naumann, 1998:185 (Australia: northwest Queensland: Musselbrook area, approximately 18°40'S 138°23'E).

*Pison aureosericeum* Rohwer, 1915:246, ♀, ♂. Holotype: ♀, Australia: Queensland: Duaringa in Dawson District (USNM), examined. **New synonym.** — Turner, 1916b:599 (in key to Australian *Pison*), 614 (comparison with *Pison pulchrinum*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:257 (in catalog of Australian Sphecidae); Pagliano, 2003:508 (Australia: first record from Northern Territory).

*Pison exornatum* Turner, 1916b:614, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. **New synonym.** — Turner, 1916b:599 (in key to Australian *Pison*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Shuckard did not indicate the number of specimens examined. I have selected as lectotype the only specimen in The Natural History, London, labeled "Type from Shuck. ? Coll." and "*P. auratus* Shuck."

Similarly, Turner did not indicate the number of the specimens examined in the original description of *Pison exornatum*. Of the two specimens from Mackay (the type locality) present in The Natural History Museum, London, I have designated as the lectotype the one bearing a handwritten label "*Pison exornatum* Turn., Type" in Turner's handwriting, and the other one as the paralectotype.

**RECOGNITION.**— *Pison auratum* can be recognized by the golden setae of the frons and clypeus (pale golden in some specimens, silvery in some males), in combination, in the female, with a clypeus flat or slightly concave just above the lamella. In the male, tergum VII is broad, almost rectangular apically (Fig. 135), sterna III-VI have short, erect setae (Fig. 136), and sternum VIII is

broadly (but not deeply), conspicuously emarginate apically (Fig. 138). Additionally, the male hindbasitarsus is slightly expanded ventrally at about basal third (Fig. 137). In the other species with golden setae on the frons and clypeus, the female clypeus is slightly convex above the lamella, and male tergum VII is a different shape, sterna III-VI are covered with appressed setae, and sternum VIII is either rounded or inconspicuously emarginate. The color of tergum I, ferruginous in most specimens (but all black in some), helps in recognition. The long flagellomere I (dorsal length  $3.0 \times$  apical width in the female, 2.7-3.0 in the male) is another subsidiary recognition feature.

**JUSTIFICATION OF NEW SYNONYMY.**—Turner (1916b) treated *Pison auratum* and *aureosericeum* as separate species and distinguished them by two characters: in the former, the ocellocular distance would be markedly less than the hindocellar diameter and sternum II all yellow, whereas in the latter the ocellocular distance would be equal to the hindocellar diameter and sternum II black (ferruginous apically). These characters, however, are variable and fully integrate when a series of specimens is examined; the ocellocular distance, in particular, ranges from 0.6 to 0.9 of the hindocellar diameter. Consequently, I regard these two names as synonyms.

Also, Turner differentiated *Pison auratum* and *exornatum*, assigning to the former "a broad, chitinous ferruginous band, clothed with golden pubescence" at the apex of tergum II, whereas no such pubescence was present in *exornatum*. In fact, there is a continuous spectrum in this character, from conspicuous to none: in some intermediate specimens, for example, the golden pubescence is visible only from certain angles from behind. As the type specimens of the two species are identical in other characters, I treat these two names as synonyms.

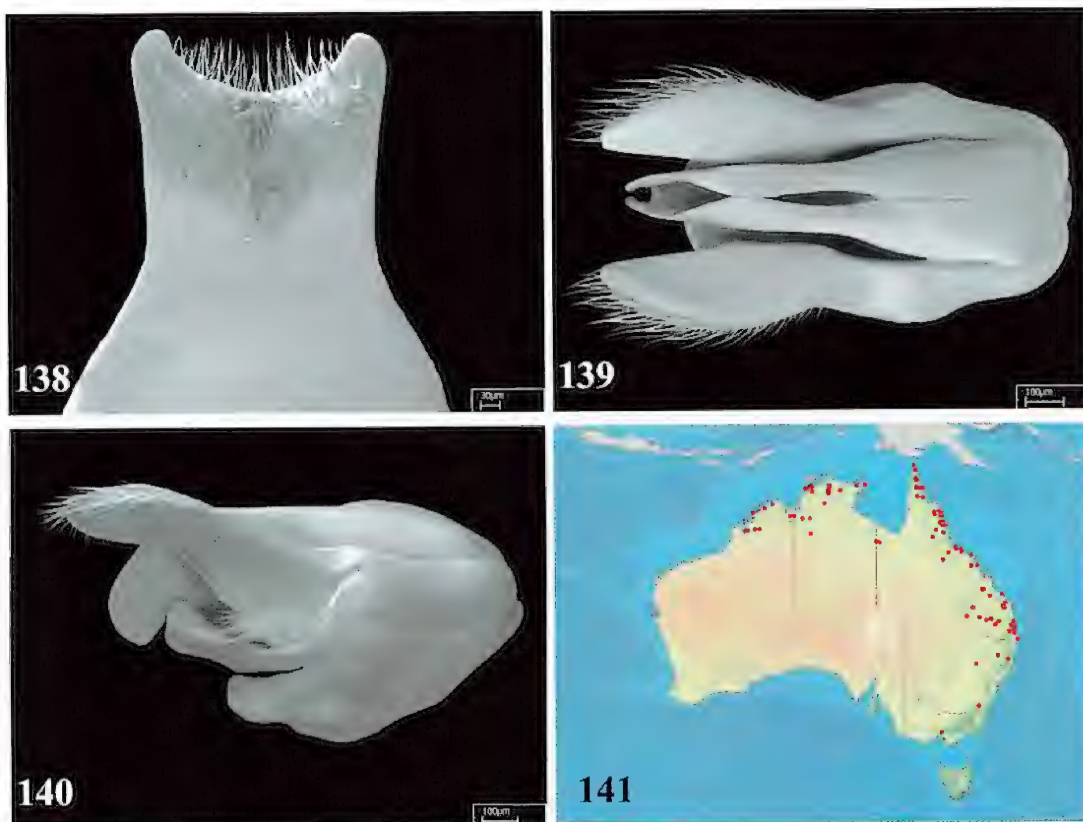
**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Propleuron sparsely punctate anteriorly in some specimens. Scutum not foveate along flange, in some specimens with a few rudimentary, short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart (many punctures slightly more than one diameter apart); interspaces microsculptured. Mesopleural punctures well defined, less than one diameter apart (more than one width anteroventrally in female from Mary Creek, Queensland). Tegula somewhat enlarged. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum in most specimens with irregular longitudinal carina separating side from posterior part of dorsum and from posterior face and extending from gastral socket area toward spiracle (carina ill defined in some specimens, and absent in some from Northern Territory); dorsum finely punctate (most punctures about one diameter apart), integument largely concealed by appressed vestiture; side punctate, punctures about one diameter apart (interspaces merging into irregular ridges anteriorly); posterior surface ridged, finely punctate between ridges. Punctures of tergum I more than one diameter apart anteriorly, becoming compressed against each other toward apical depression. Sternum II punctate throughout, punctures relatively large. Most punctures of posteroventral forefemoral surface less than one diameter apart, but several punctures more than one diameter apart (punctures averaging several diameters apart in some specimens).

Setae intensely golden in most specimens on head, thorax, and propodeum, but only with golden tinge in some (see Variation below); completely concealing integument on frons and clypeus; several setae erect or suberect on gena (sinuous or not), pronotal collar, in most specimens also on scutum, appressed on tergum I; setal length up to one midocellar diameter, that of sinuous genal setae up two midocellar diameter. Mesopleural setae totally concealing integument in specimens from northern part of Northern Territory (Kakadu National Park to Keep River National Park), and





FIGURES 132–137. *Pison auratum* Shuckard. (132) Female clypeus and mandibles; (133) Male clypeus and mandibles; (134) Female gaster in dorsal view; (135) Male tergum VII in dorsal view; (136) Gastral apex of male in lateral view; (137) Male hindbasitarsus in lateral view.



FIGURES 138–140. *Pison auratum* Shuckard, male. (138) Sternum VIII (ventral surface); (139) Genitalia in dorsal view; (140) Genitalia in lateral view.

FIGURE 141. Collecting localities of *Pison auratum* Shuckard.

those from Western Australia. Apical depression of tergum I with conspicuous setal fascia partly or totally concealing integument, fasciae of terga II and III varying from conspicuous to absent.

Head, thorax, and propodeum black, mandible yellowish reddish except dark brown apically; clypeus ferruginous mesoventrally in many females; scape, pedicel and flagellomere I to I-V yellowish reddish. Wings nearly hyaline to slightly infumate, darker along apical margin; humeral plate ferruginous. Femora, tibiae, and tarsi ferruginous except femora largely black in some specimens (but see Variation below). Tergum I ferruginous (black basally) in most specimens (Fig. 134), but all black in a female from 11 km S Townsville (see Variation below) and five males from Canberra, A.C.T.; tergum II black in most specimens but ferruginous in some, either preapically, or in apical half, or all; tergum III all black to ferruginous, remaining terga black to ferruginous.

♀.—Upper interocular distance equal to  $0.63\text{--}0.72 \times$  lower interocular distance; ocellocular distance equal to  $0.6\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli  $0.8\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.96\text{--}0.98 \times$  distance between eye notches. Clypeus flat or shallowly concave medioventrally (adjacent to lamella); free margin of lamella arcuate or obtusely angulate (Fig. 132). Dorsal length of flagellomere I  $3.0 \times$  apical width, of flagellomere IX  $1.3\text{--}1.4 \times$  apical width. Mandible with inconspicuous incision on trimmal carina at about two thirds of length. Tergum VI rounded apically. Length 9.2–13.7 mm; head width 2.7–3.4. mm.

♂.—Upper interocular distance equal to  $0.70\text{--}0.73 \times$  lower interocular distance; ocellocular distance equal to  $1.0\text{--}1.2 \times$  hindocellar diameter, interocellar distance  $0.9\text{--}1.2 \times$  hindocellar diameter;



eye height equal to  $0.90\text{--}0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 133). Dorsal length of flagellomere I  $2.7\text{--}3.0 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Hindbasitarsus slightly expanded ventrally at about basal third (Fig. 137). Tergum VII broad, almost rectangular apically (Fig. 135). Sterna III-VII (also sternum II apically) with dense, erect setae whose length is about equal to midocellar diameter (Fig. 136); sternum VIII broadly but not very deeply emarginate apically (Fig. 138), each lateral arm bent slightly ventrad. Genitalia: Figs. 139, 140. Length  $8.2\text{--}11.2$  mm; head width  $2.5\text{--}3.0$  mm.

**VARIATION.**— I treat as *auratum* five males from Canberra, A.C.T. because of their subquadrate tergum VII and widely emarginate sternum VIII. These specimens, however, differ from the other males examined by the following: 1. their frontal setae are silvery, 2. the gaster is all black, and 3. in one of them the hindtibia is all black.

**NESTING HABITS.**— Naumann (1983) observed *Pison auratum* in northern Queensland using abandoned nests of *Sceliphron laetum* (F. Smith), apparently favoring those cells that have been subdivided by an *Odynerus* sp. Females provision cells with two or three spiders and lay a single egg on the opistosoma of one of them; they sometimes steal spider prey from unattended open cells of other females. To seal the cell, the female regurgitates some fluid over the nest  $1\text{--}2$  mm away from the cell opening and tears off small quantities of mud that she uses to construct a slightly recessed plug. Females are apparently tolerant toward each other: although there were frequently two adults per nest, no fighting was observed between them. On one occasion two residents came face-to-face, then one of them turned and walked around on the nest with the other following.

**GEOGRAPHIC DISTRIBUTION** (Fig. 141).— Northern and eastern Australia.

**RECORDS.**— **AUSTRALIA:** **Australian Capital Territory:** Canberra (4 ♂, ANIC; 1 ♂, CAS). **New South Wales:** Ballina (1 ♀, 1 ♂, AMS), Bellbrook (2 ♀, 2 ♂, AMS), Mount Yarrowyck (1 ♀, ANIC), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (2 ♀, 2 ♂, CAS; 1 ♀, UCD). **Northern Territory:** Batchelor (Pagliano, 2003), Buchanan Highway 2 km SE Jasper Creek crossing at  $16^{\circ}00'52"S$   $130^{\circ}48'18"E$  (1 ♂, ANIC), Bynoe Harbour (1 ♀, SAM; 1 ♀, BMNH), 5 km NNW Cahills Crossing in Kakadu National Park at  $12^{\circ}23'S$   $132^{\circ}57'E$  (1 ♀, 1 ♂, ANIC), 7 km NNW Cahills Crossing in Kakadu National Park at  $12^{\circ}23'S$   $132^{\circ}56'E$  (1 ♂, ANIC), Cockatoo Woman Cave in Kakadu National Park at  $12^{\circ}24'S$   $132^{\circ}57'E$  (2 ♀, 2 ♂, ANIC), Cape Arnhem: no specific locality (1 ♀, AMS), Darwin (2 ♀, SAM; 1 ♂, NTM; 15 ♀, 4 ♂, QMB), Deaf Adder Valley in Kakadu National Park (1 ♂, ANIC), Fogg Bay at  $12^{\circ}43'S$   $130^{\circ}21'E$  (1 ♀, QMB), Gregory National Park (Pagliano, 2003), Holmes Jungle near Darwin (1 ♂, NTM), Jim Jim Falls (1 ♂, ANIC; 1 ♀, AMS), Kakadu National Park (2 ♀, CAS), Keep River National Park at  $15^{\circ}45'44"S$   $129^{\circ}05'55"E$  (1 ♂, USU), Koongarra 15 km E Mount Cahill in Kakadu National Park at  $12^{\circ}52'S$   $132^{\circ}50'E$  (1 ♂, ANIC), 76.9 km NNE Lajamanu at  $17^{\circ}40'30"S$   $130^{\circ}54'14"E$  (1 ♀, ANIC), Mount Cahill in Kakadu National Park at  $12^{\circ}47'S$   $132^{\circ}51'E$  (1 ♂, ANIC), 19 km NE Mount Cahill at  $12^{\circ}50'S$   $132^{\circ}52'E$  (4 ♀, ANIC) and at  $12^{\circ}45'S$   $132^{\circ}51'E$  (1 ♀, ANIC), Ngarradj Warde Djobekeng in Kakadu National Park (1 ♂, ANIC), Nitmiluk (formerly Katherine Gorge) National Park (1 ♀, QMB), Nourlangie Rock in Kakadu National Park at  $12^{\circ}51'S$   $132^{\circ}48'E$  (13 ♀, 6 ♂, ANIC), Obiri Rock in Kakadu National Park at  $12^{\circ}25'S$   $132^{\circ}57'E$  (3 ♀, 2 ♂, ANIC), 6 km SSW Oenpelli in Kakadu National Park at  $12^{\circ}22'S$   $133^{\circ}01'E$  (1 ♀, 1 ♂, ANIC), Rankin Point at  $12^{\circ}41'S$   $130^{\circ}35'E$  (1 ♂, NTM), Sorcery Rocks in Kakadu National Park at  $12^{\circ}23'S$   $132^{\circ}58'E$  (5 ♀, 6 ♂, ANIC), Virginia 31 km SE Darwin Central Business District at  $12^{\circ}33'S$   $131^{\circ}02'E$  (1 ♂, NTM), Woolwonga Nature Reserve in Kakadu National Park (1 ♀, ANIC). **Queensland:** Agnes Water 40 km E Miriam Vale (1 ♀, AMS), Almaden (1 ♂, AMS), Annan River at The Little Forks (1 ♀, ANIC), Arcadia on Magnetic Island at  $19^{\circ}09'S$   $146^{\circ}52'E$  (1 ♀, ANIC), 15 mi. N Ayr (1 ♀, CAS), Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}30'E$  (1 ♀, ANIC), 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$  (4 ♀, 14 ♂, ANIC), 7 km S Batavia Downs at  $12^{\circ}43'S$   $142^{\circ}42'E$  (2 ♀, 5 ♂, ANIC), 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$  (2 ♀, 3 ♂, ANIC), Biggenden (1 ♀, ANIC), Biloela (1 ♀, QMB), Boonah at  $27^{\circ}59'49"S$   $152^{\circ}40'54"E$  (1 ♂, SAM; 1 ♀, WAM), Bribie Island (1 ♀, QMB), Brisbane (1 ♀, CAS; 2 ♂, QMB), Brisbane: Blunder Creek (1 ♂, QMB), Brisbane: Indooroopilly (1 ♀, BMNH), Brisbane: Karawatha Forest at  $27^{\circ}38.6'S$   $153^{\circ}04.2'E$  (2 ♂, CAS), Brookfield near Brisbane (1 ♀, BMNH), Chinchilla (1 ♀, QMB), Claudie River near Mount Lamond (1 ♂, AMS), Clifton Beach (1 ♀, ANIC),



Coast Range ca 17 km S Biggedden (1 ♂, ANIC), Cockatoo Creek at 11°39'S 142°27'(1 ♀, ANIC), Condamine (1 ♀, AMS), Cooktown (1 ♀, SAM), Crediton State Forest at 21°11.9'S 148°29.9'E (1 ♀, CAS), Dalby (1 ♀, QMB), 39 km NE Dalby at 26°59.6'S 151°33.4'E (1 ♀, CAS), 9 km NW Degilbo (1 ♂, ANIC), 9 km S Dingo Beach at 20°05.5'S 148°30.2'E (1 ♀, 11 ♂, CAS), Duaringa in Dawson District (1 ♀, USNM, holotype of *P. aureosericeum*), Edungalba (1 ♀, ANIC), 30 km W Fairview via Laura (1 ♀, ANIC), Fletcher Creek 43 km NW Charters Towers at 19°48.9'S 146°03.3'E (7 ♀, 21 ♂, CAS), Heathlands at 11°45'S 142°35'E (6 ♀, 8 ♂, ANIC), 12 km SSE Heathlands at 11°51'S 142°38'E (1 ♀, ANIC), Highvale (1 ♀, QMB), 14 km NW Hope Valley Mission at 15°16'S 144°59'E (1 ♂, ANIC), Inkerman (1 ♀, BMNH), Kings Plains Lake 47 km SW Cooktown (1 ♀, AMS), Lake Broadwater at 27°21'S 151°06'E (2 ♀, 2 ♂, QMB), Lamington National Park (2 ♀, RMNH), Lawn Hill (now Boodjamulla) National Park at 18°35'15"S 138°04'28"E (1 ♀, QMB), Mackay (1 ♀, BMNH, lectotype of *Pison exornatum*), Mary Creek 14 mi N Mount Molloy (2 ♀, CAS), Millstream Falls National Park (1 ♂, CAS), Mitchell (1 ♂, QMB), Moa Island in Torres Strait (1 ♂, SAM), Mount Carbine at 16°31'42"S 145°07'41"E (1 ♀, 2 ♂, AMNH), 4 km WNW Mount Cotton at 27°36'S 153°10'E (1 ♀, QMB), Mount Surprise at 18°08'52"S 144°19'05"E (1 ♂, AMNH), Mount Walsh National Park near Biggenden (3 ♀, 1 ♂, ANIC), Musselbrook area at approximately 18°40'S 138°23'E (Naumann, 1998), Old Laura Homestead (1 ♀, AMS), Peach Creek crossing 25 km NNE Coen (1 ♀, ANIC), Pendland at 20°31.0'S 145°24.2'E (4 ♀, 2 ♂, CAS), Pinnacle Creek 27 km N Archer Crossing (1 ♀, ANIC), Port Douglas (3 ♀, 1 ♂, AMS), 2 km from Punsand Bay at 10°43'S 142°28'E (1 ♀, ANIC), Ravenshoe (1 ♀, 2 ♂, AMS), 2 km N Rokeby at 13°39'S 142°40'E (7 ♂, ANIC), Southedge 11 km NW Mareeba (1 ♀, ANIC), Split Rock 14 km SE Laura at 15°39'S 144°31'E (9 ♀, 7 ♂, ANIC), Tamborine Village (4 ♀, QMB), Townsville (1 ♂, USNM), 11 km S Townsville at 19°21.8'S 146°53.2'E (2 ♀, CAS), near Townsville (3 ♀, CAS), Wallum Reserve near Bundaberg (1 ♀, ANIC), 13 km SE Weipa at 12°40'S 143°00'E (3 ♀, ANIC), 4 km E Yuleba (1 ♀, QMB). **Victoria:** Eltham (1 ♂, AMS), no specific locality (Turner, 1916b, as *exornatum*). **Western Australia:** Augustus Island (1 ♀, ANIC), Barker Gorge in Napier Range (1 ♀, WAM), Derby (2 ♀, CAS), 7.8-9.7 km SE Derby (♂, WAM), King Edward River (1 ♀, SAM), 14 km SE Kulumburu Mission at 14°25'S 126°40'E (2 ♀, ANIC), cave W Kununurra at 15°46'S 128°39'E (1 ♀, NTM), Mitchell Plateau at 14°52'S 125°50'E (1 ♂, ANIC), 1 km NE Mount Bell at 17°10'S 125°17'E (1 ♂, WAM). **Origin unknown:** 1 ♀, lectotype of *Pison auratum* (BMNH).

### *Pison aurifex* F. Smith

Figures 142-150.

*Pison aurifex* F. Smith, 1869:293, ♀, ♂. Lectotype: ♀, Australia: no specific locality (BMNH), **present designation**, examined. — Kohl, 1885:186 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:710 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*), 612 (recognition characters); Schulthess Rechberg, 1935:306 (Australia: Northern Territory: Marakai, determination tentative, as *aurifer*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:257 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— F. Smith (1869) described both sexes of this species, but did not mention the exact number of specimens examined. Two females and two males are present in The Natural History Museum, London, of which I labeled one female as the lectotype of *Pison aurifex*, rendering the remaining specimens paralectotypes.

**RECOGNITION.**— Like *P. elongatum* and *P. emarginatum*, *P. aurifex* has three submarginal cells, the second recurrent vein interstitial with second intersubmarginal vein or nearly so, mesopleural punctures about one diameter apart at the center or slightly less (interspaces shiny), some setae erect (but not longer than the midocellar diameter) along the lateral margin of tergum I, no carina between propodeal dorsum and side, gaster all or largely black (except apical segment), with apical depressions of terga ferruginous, and the tibiae contrastingly ferruginous. The three species also share well-defined punctures of the upper frons. *Pison aurifex* differs from *P. elongatum* in having the scutal punctures minute (rather than small but not minute) with linear interspaces (not

linear in the female of *P. elongatum*), wing veins ferruginous (rather than brown), wing membrane yellowish (rather than hyaline), male sternum VIII triangular (rather than with the lateral margins subparallel), rounded apically (rather than roundly truncate). Unlike *P. emarginatum*, the frons of *P. aurifex* is not swollen above the antennal socket (rather than swollen), the clypeal lamella of the female is arcuate (Fig. 142) rather than angular (Fig. 357), and male sternum VIII is triangular, rounded apically (rather than practically parallel-sided, deeply emarginate apically). Subsidiary recognition features of *P. aurifex* are: hindcoxal dorsum without carina along outer margin basally, and setae of head, thorax, propodeum, and gaster pale golden.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about  $1.5 \times$  midocellar diameter. Scutum dull, not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart (Fig. 144). Mesopleural punctures well defined, slightly less than one diameter apart; interspaces unsculptured. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without carina separating side from dorsum and posterior surface, dorsum and side punctate (punctures less than one diameter apart) except for median sulcus on dorsum and oblique ridges adjacent to sulcus; posterior surface punctate in dorsal half, punctate and ridged in ventral half. Posteroventral forefemoral surface minutely punctate, punctures averaging about two diameters apart. Hindcoxal dorsum with outer margin not carinate basally. Punctures of tergum I minute, averaging about one diameter apart. Sterna densely punctate throughout, punctures small but well defined.

Setae golden on head, thorax, propodeum, and gaster (almost silvery on frons and clypeus in specimen from Crediton Forest, Queensland), concealing integument on pronotal collar, most of horizontal portion of tergum I in type series, and apical depressions of terga, partly so on propodeal dorsum, erect on frons, suberect on lower gena and forecoxal venter (setal length up to  $1.5 \times$  midocellar diameter), appressed on scutum, less than one midocellar diameter on femora, erect along lateral margin of tergum I but not longer than one midocellar diameter.

Head, thorax, and propodeum black; scape, pedicel, and flagellomeres I and II ferruginous (scape and pedicel may be largely black); mandible ferruginous, dark brown basally and apically. Femora black basally, ferruginous apically (basal half of midfemur ferruginous ventrally in most specimens, all venter ferruginous in specimen from Crediton Forest), tibiae and tarsi ferruginous. Gaster black, apical depressions of terga yellowish reddish, apical segment yellowish reddish except black basally or basomedially (Fig. 145).

♀.—Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $1.5\text{--}1.6 \times$  hindocellar diameter, distance between hindocelli  $1.0 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella minimally convex, nearly straight (Fig. 142), but acutely angulate in one female from Eungella National Park, Queensland. Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Length 11.7–13.2 mm; head width 3.0–3.2 mm.

♂.—Upper interocular distance equal to  $0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.7\text{--}1.8 \times$  hindocellar diameter, distance between hindocelli  $1.1 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Middle clypeal lamella obtusely pointed (Fig. 143). Flagellomeres II–IV slightly concave basoventrally, slightly convex apicoventrally. Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII punctate throughout, acutely triangular, rounded apically (Fig. 146). Genitalia: Figs. 147–149. Length 8.8–10.0 mm; head width 2.5–2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 150).—Eastern New South Wales, eastern Queensland.

**RECORDS.**—AUSTRALIA: New South Wales: Epping (1 ♀, AMS). Queensland: Bluff Range near



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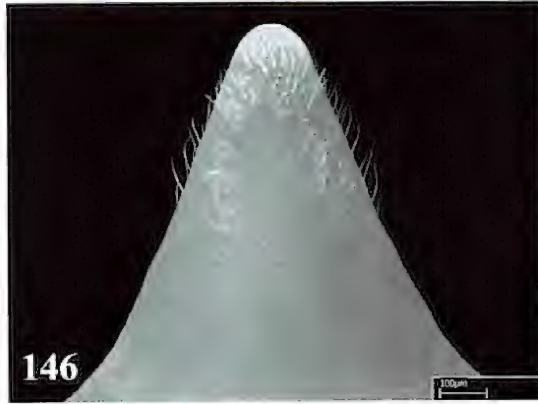
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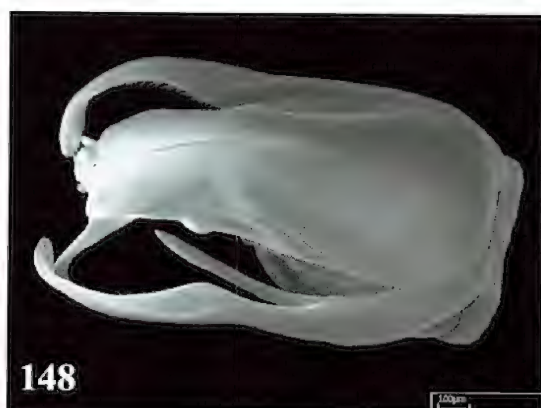
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FIGURES 142–147. *Pison aurifex* F. Smith. (142) Female clypeus and mandibles; (143) Male clypeus and mandibles; (144) Female tegula and adjacent scutum; (145) Female gaster in dorsal view; male: (146) Sternum VIII (ventral surface); (147) Genitalia in dorsal view.





FIGURES 148–149. *Pison aurifex* F. Smith, male. (148) Genitalia in lateral oblique view; (149) Genitalia in lateral view.

FIGURE 150. Collecting localities of *Pison aurifex* F. Smith.



Biggenden (1 ♂, ANIC), Brisbane (1 ♀, QMB), Brisbane: Blunder Creek (1 ♀, QMB), Crediton State Forest at 21°11.8'S 148°29.9'E (1 ♂, CAS), Eungella National Park (2 ♀, QMB), Maryborough at 25°32'S 152°44'E (1 ♀, ANIC), Petrie (1 ♀, QMB). **No specific locality:** (2 ♀, 2 ♂, BMNH, lectotype and paralectotypes of *Pison aurifex*).

### *Pison auriventre* Turner

Figures 151–165.

*Pison auriventre* Turner, 1908:512, ♀. Lectotype: ♀, Australia: Victoria: no specific locality (BMNH), **present designation**, examined. – Turner, 1916b:598 (in key to Australian *Pison*), 608 (golden pilosity on gaster; Australia: Queensland: Brisbane); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Evans, 1981:425 (nesting habits); Cardale, 1985:258 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Of the two females of this species in The Natural History Museum London, I have selected as the lectotype the one bearing the label “Type” and the identification label “*Pison auriventris*” in Turner’s handwriting. The other female was designated as the paralectotype.

**RECOGNITION.**— *Pison auriventre* is an all black species, with the setae appressed on tergum I. Both sexes are characterized by the lower gena adjacent to the oral fossa glabrous, practically impunctate (at most with a few minute, scattered punctures). The tegula is elongate, and the mesopleuron adjacent to the metapleuron and the propodeal side adjacent to the metapleuron below the dorsal pit each has a conspicuously foveolate sulcus.

The female has a psammophore on the lower gena and posterior mandibular margin, and is further characterized by a well-defined, broad middle clypeal lobe, the clypeal lamella having an obtuse but well-defined corner on each side (the distance between the corners slightly greater than the distance between a corner and the adjacent orbit), and the ocellocular distance 1.1–1.3 × hindocellar diameter; the setae on the forefemoral venter are erect, but not forming a real psammophore. It closely resembles *Pison argentifrons*, but differs from the latter in having, scutal punc-

tures contiguous (rather than less than one diameter apart, but not contiguous), tergum VI broader (compare Figs. 93 and 160) and in many specimens a golden (rather than silvery) vestiture on the frons. It differs from other species with psammophores by an elongate tegula.

In the male, flagellomeres III-VI are expanded apicoventrally, but at least flagellomere IV is concave basoventrally (Fig. 158), scutal punctures contiguous, and sternum VIII is largely unsculptured and truncate to broadly, shallowly emarginate apically, without transverse carina (Fig. 161). *Pison argentifrons* is similar, but has the flagellomeres cylindrical, scutal punctures less than one diameter apart, but not contiguous, the basal glabrous area of sternum VIII conspicuously convex (rather than only slightly convex). Also similar is *P. antennatum*, in which the gena is setose on each side of the oral fossa, the flagellomeres are not concave basoventrally, and sternum VIII has a narrow subbasal V-shaped impression and a transverse, preapical carina (Figs. 64, 65), two features that lack in *auriventre*.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures averaging less than one diameter apart. Scape inflated in lateral view (Fig. 155). Labrum transverse, not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal and mesopleural punctures fine, contiguous (Fig. 156); interspaces markedly microsculptured, dull. Tegula elongate (Fig. 157). Postspiracular carina present but ill defined, about as long as midocellar diameter. Mesopleuron adjacent to metapleuron and propodeal side adjacent to metapleuron below dorsal pit with conspicuously foveolate sulcus. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, punctures nearly contiguous, interspaces merging into fine ridges except ridges conspicuous along anterior margin and on each side of middle carina; side ridged; posterior surface ridged. Hindcoxal dorsum with outer margin carinate except basally. Punctures of tergum I minute, no more than one diameter apart. Sternum II punctate throughout, punctures well defined.

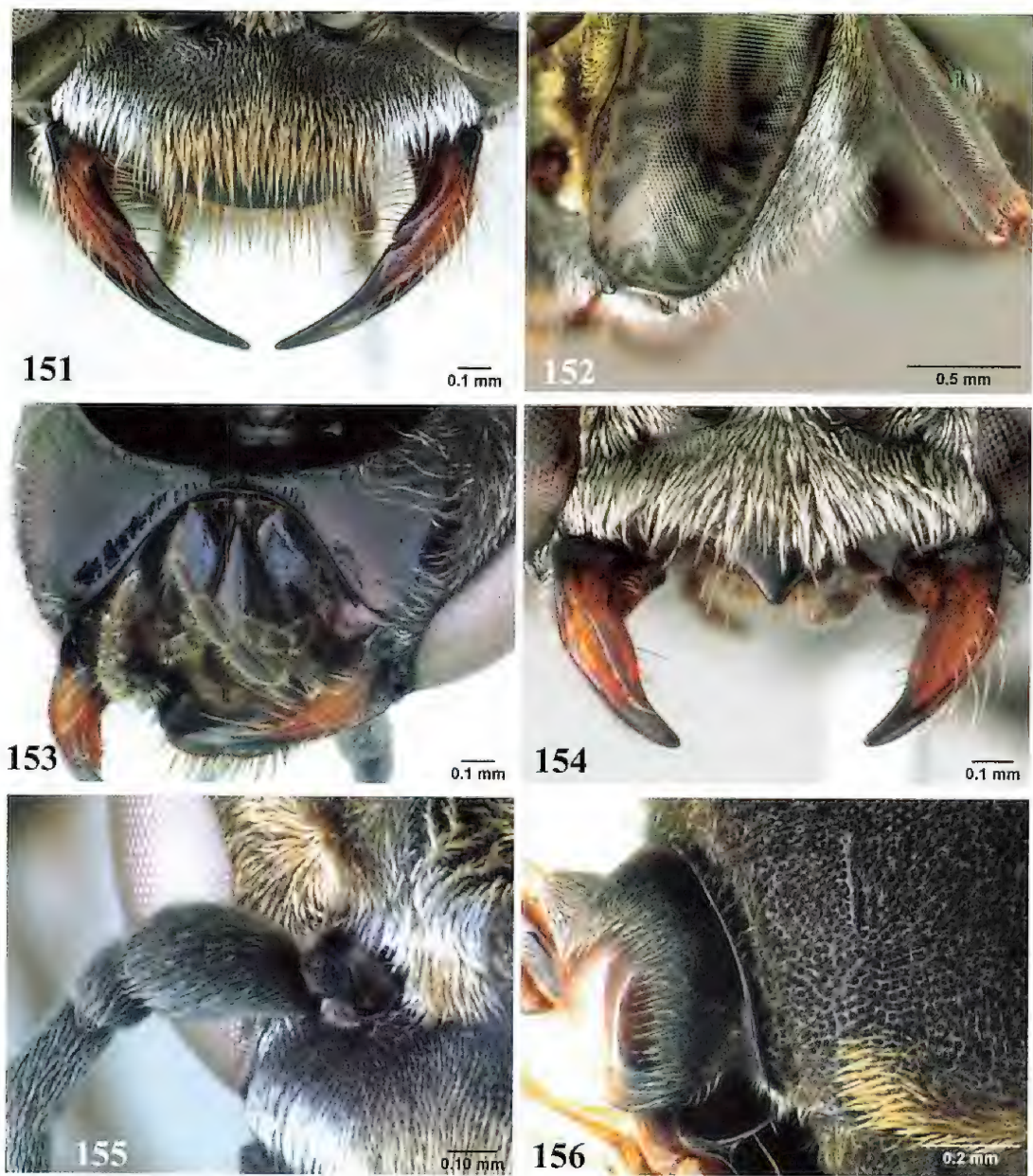
Setae silvery on head and thorax except golden on frons and clypeus mesally in many females and some males, golden on terga (Fig. 159) except silvery on tergum I posterolaterally and on tergum II anterolaterally and in most specimens on propodeal dorsum, appressed on scutum and tergum I, concealing integument on frons, clypeus (except lamella), and in many specimens on propodeal dorsum; see below for genal setae.

Head (including antenna), thorax, propodeum, legs, and gaster black, mandible black basally, yellowish brown mesally, dark brown apically; tarsi ferruginous apically in many specimens.

♀.—Upper interocular distance equal to  $0.7 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $1.18 \times$  distance between eye notches. Free margin of clypeal lamella almost straight, minimally concave laterally (Fig. 151), corner obtuse but well defined (distance between corners slightly greater than distance between corner and adjacent orbit). Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Lower gena (Fig. 152) and mandibular posterior margin with psammophores (longest setae of genal and mandibular psammophores about  $0.5 \times$  greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophore (Fig. 153); forefemoral venter with erect setae that are up to  $1.0\text{--}1.5$  midocellar diameter long and that do not form psammophore. Tergum VI obtusely angulate (Fig. 160). Length  $7.8\text{--}8.7$  mm; head width  $2.4\text{--}2.5$  mm.

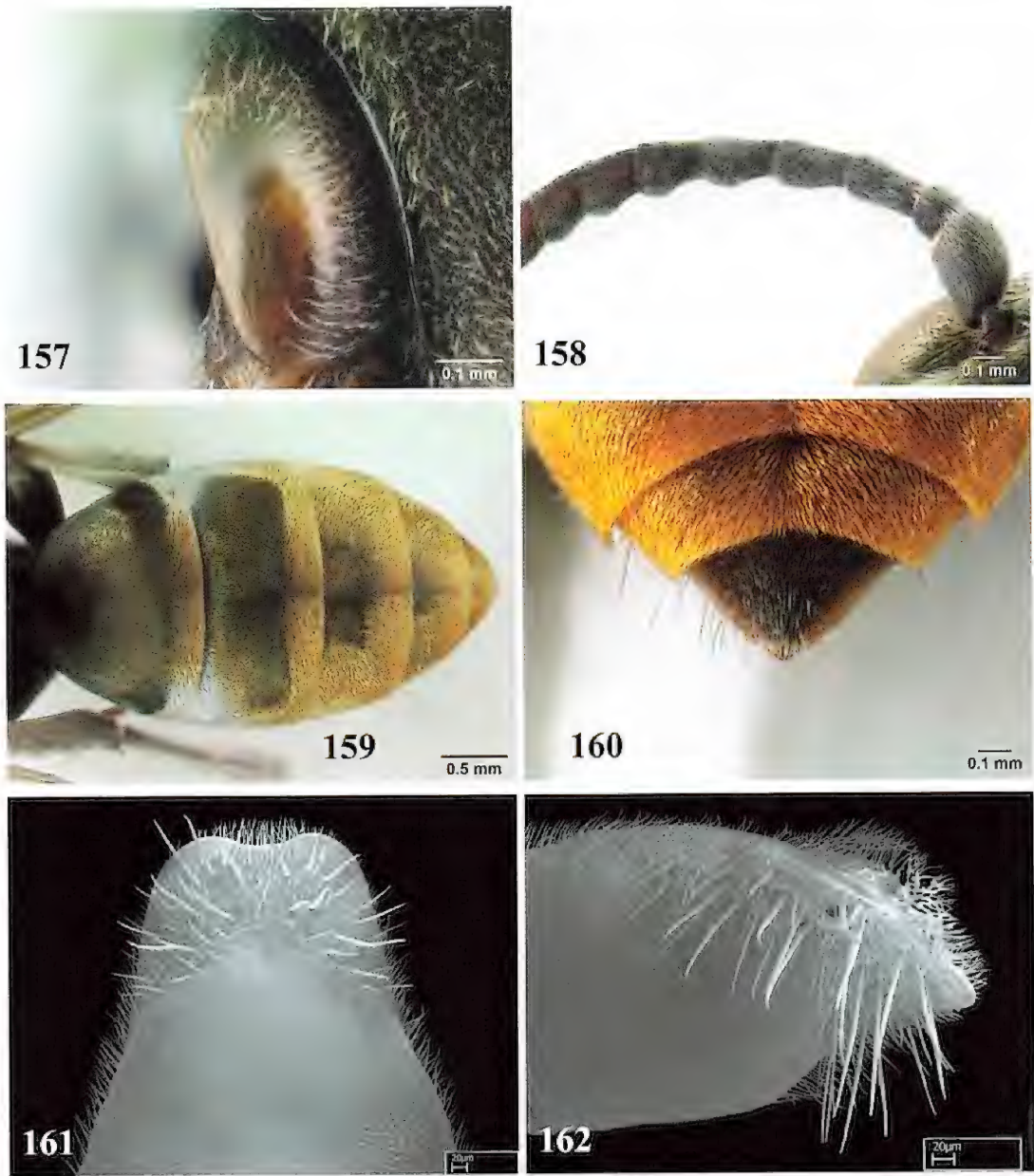
♂.—Upper interocular distance equal to  $0.85 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.5 \times$  hindocellar diameter; eye height equal to  $1.1 \times$  distance between eye notches. Free margin of clypeal lamella



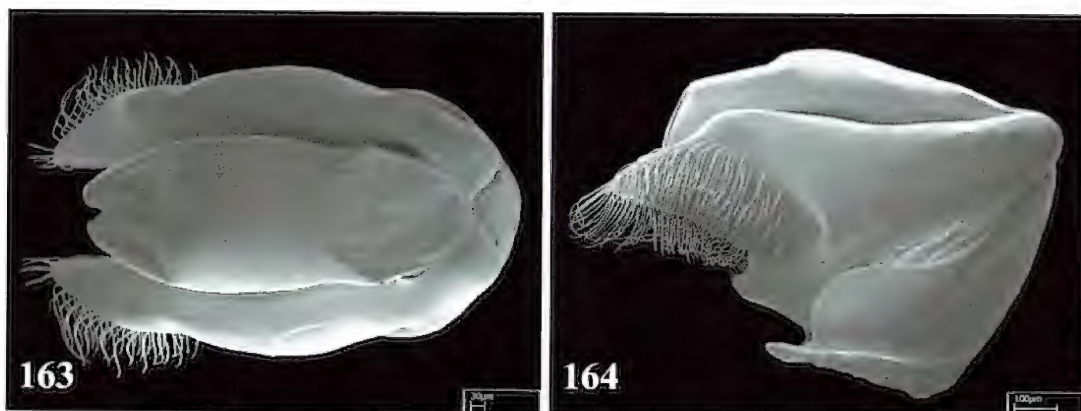


FIGURES 151–156. *Pison auriventre* Turner. (151) Female clypeus and mandibles; (152) Female gena showing psamphore; (153) Female head from below showing unsculptured areas; (154) Male clypeus and mandibles; (155) Female scape in lateral view; (156) Female tegula and adjacent scutum.





FIGURES 157–162. *Pison auriventre* Turner. (157) Female tegula; (158) Basal flagellomeres of male; (159) Female gaster in dorsal view; (160) Apex of female gaster; male; (161) Sternum VIII (ventral surface); (162) Sternum VIII (ventral surface in lateral oblique view).



FIGURES 163–164. *Pison auriventre* Turner, male. (163) Genitalia in dorsal view; (164) Genitalia in lateral view.

acutely angulate (Fig. 154). Flagellomeres II–VIII with tyloids, flagellomeres III–VI concave basoventrally, convex apicoventrally (Fig. 158). Dorsal length of flagellomere I  $1.9 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Lower gena with only a few, minute, sparse punctures and associated setae on either side of oral fossa. Sternum VIII largely unsculptured and shiny, punctate only laterally and apically, truncate to broadly, shallowly emarginate apically (Figs. 161, 162). Genitalia: Figs 163, 164). Length 6.0–7.5 mm; head width 1.8–2.3 mm.

**NESTING HABITS.**— Evans (1981) observed two females of this species digging their nests on the crest of a clay bank in the southern part of the city of Brisbane. “Both were digging a vertical hole by backing out with small lumps of soil in their mandibles and flying off about a meter and dropping the soil from a height of about half a meter. Thus no soil accumulated at the entrances. Three days later one of the wasps was seen bringing in small spiders, carrying them in her mandibles in flight, landing near the entrance, and walking directly into the open hole with the prey”. The nest was found to have a vertical burrow 3 mm in width, 4.5 cm in length, and terminating in an oblique cell measuring 11 mm in length and 5 mm in width. The cell, apparently not fully provisioned, contained four paralyzed spiders but no egg. Another cell, 1 cm away, was closed and fully provisioned. It contained nine spiders, the uppermost one in the cell bearing the wasp’s egg dorsally, obliquely at the extreme base of the opistosoma. All spiders were very small Lycosidae of two species, *Lycosa laeta* L. Koch and *Trochosa expolita* L. Koch, currently *Artoriopsis expolita* (L. Koch).

**GEOGRAPHIC DISTRIBUTION** (Fig. 165).— All Australia except Tasmania.

**RECORDS.**— **AUSTRALIA:** **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (1 ♂, CAS), 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (1 ♀, 1 ♂, CAS), Lightning Ridge (1 ♀, AMS), 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$  (1 ♂, CAS), 5 mi. N Rankins Springs (1 ♀, BMNH), Warrenburg National Park (1 ♀, UCD). **Northern Territory:** Keep River National Park at  $15^{\circ}54'55"S$   $129^{\circ}04'11"E$  (1 ♂, ANIC). **Queensland:** Brisbane (Turner, 1916b; Evans, 1981), 6 km N Taroom at  $25^{\circ}36'S$   $149^{\circ}46'E$  (1 ♀, QMB). **South Australia:** Dingly Dell Camp on Oraparinna Creek at  $31^{\circ}21'S$   $138^{\circ}42'E$  (3 ♀,



FIGURE 165. Collecting localities of *Pison auriventre* Turner.

ANIC), 79 km NNW Renmark at 33°31'S 140°24'E (2 ♀, 1 ♂, ANIC), Trezona Camp at Brachina Creek at 31°20'S 138°37'E (1 ♂, ANIC), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (72 ♀, 82 ♂, CAS), 3 km ENE Wilpena at 31°31.0'E 138°36.6'E (1 ♀, 1 ♂, CAS), Wilpena Pound Gap at 31°33'S 138°36'E (1 ♀, ANIC). **Victoria:** Gunbower (1 ♂, BMNH); no specific locality (2 ♀, BMNH, lectotype and paralectotype of *Pison auriventre*). **Western Australia:** 10 km W Cobra Station at 24°10.2'S 116°23.0'E (2 ♀, ANIC; 1 ♀, USU), 28 mi. E Leonora (21 ♀, 20 ♂, CAS), 45 km S Newman on Great Northern Highway at 23°42.4'S 119°44.3'E (1 ♀, USU), 158 km S Newman (= 9 km N Kumarina Roadhouse) at 24°37.8'S 119°36.8'E (1 ♀, ANIC), 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E (1 ♂, ANIC; 3 ♀, CAS; 1 ♀, 1 ♂, USU).

***Pison austrinum* Pulawski, species nova**

Figures 166-168.

**NAME DERIVATION.**—*Austrinum* is the Latin neuter adjective meaning *southern*; with reference to the specimens originating from South Australia.

**RECOGNITION.**—The female of *P. austrinum* (the male is unknown) has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. It is further characterized by the following: propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, and setae of lower gena appressed, straight, about as long as  $0.5 \times$  midocellar diameter. *Pison angustivertex* and *P. brachyceras* are similar, but *P. austrinum* differs in having the legs ferruginous (rather than black); also, the dorsal length of flagellomere I is  $1.6 \times$  the apical width, while it is  $1.8\text{--}2.0 \times$  in *P. angustivertex*.

**DESCRIPTION.**—Frons swollen above antennal socket, conspicuously microsculptured, finely, shallowly punctate, punctures about one diameter apart; middle supraantennal carina present or absent. Occipital carina not joining hypostomal carina. Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, about one diameter apart. Tegula somewhat enlarged. Mesopleural punctures well defined, less than one diameter apart (some punctures slightly more than one diameter apart in holotype). Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus with two or three fine ridges between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly obliquely ridged, punctate between ridges, only punctate laterally; side finely ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface microscopically punctate, punctures about 2-3 diameters apart. Hindcoxa dorsum with outer margin obtusely carinate. Punctures of tergum I well defined on horizontal portion, about one diameter apart, microscopically small on apical depression. Sterna closely punctate throughout.

Setae silvery, suberect and oriented obliquely dorsally on upper frons, suberect on scutum, about  $0.5 \times$  as long as midocellar diameter, appressed on tergum I; appressed, straight on lower gena, about  $0.5 \times$  as long as midocellar diameter; not completely concealing integument on clypeus. Apical depressions of terga with silvery setal fasciae, well-defined only from certain angles.

Head, thorax, propodeum, and gaster black, clypeal lamella ferruginous, mandible ferruginous except black basally and apically. Femora, tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.88\text{--}0.90 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4 \times$





FIGURES 166–167. *Pison austrinum* Pulawski, sp. nov., female. (166) Clypeus and mandibles; (167) Head in dorsal view.

hindocellar diameter (Fig. 167); eye height equal to  $0.92\text{--}0.98 \times$  distance between eye notches. Clypeal lamella somewhat elongate, its free margin obtusely angulate (Fig. 166). Dorsal length of flagellomere I  $1.6 \times$  apical width, of flagellomere IX  $1.2\text{--}1.3 \times$  apical width. Mandible: trimmal carina forming small, round tooth proximally of incision (Fig. 166). Length 5.8–6.5 mm; head width 1.8–1.9 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 168).—South Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: South Australia: Chowilla Game Reserve 24 air km N Renmark at  $33^{\circ}58.0'S$   $140^{\circ}48.8'E$ , 6 Dec 2010, V. Ahrens and W.J. Pulawski (SAM).

PARATYPE: AUSTRALIA: South Australia: 10 km NNW Penong at  $31^{\circ}50.3'S$   $132^{\circ}57.9'E$ , 16 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS).



FIGURE 168. Collecting localities of *Pison austrinum* Pulawski, sp. nov.

### *Pison barbatum* Evans

Figures 169–177.

*Pison barbatum* Evans, 1981:424, ♀. Holotype: ♀, Australia: Queensland: Port Douglas (QMB), examined. — Cardale, 1985:258 (in catalog of Australian Sphecidae).

**RECOGNITION.**—*Pison barbatum* is an all black species (except for the mandibles) with three submarginal cells, the setae appressed on the scutum and tergum I, and scutal and mesopleural punctures less than one diameter apart.

The female has a psammophore each on the gena, mandibular posterior margin, propleural and forecoxal outer margins, and foretrochanteral and forefemoral venters. It differs from other such species in having an unusually broad clypeal lamella, the distance between its corners being  $1.7\text{--}1.9 \times$  as great as the distance between a corner and the adjacent orbit (in the other species with psammophores, this distance is  $1.1\text{--}1.5 \times$  the distance between a corner and the adjacent orbit, or less). Subsidiary recognition features are: the distance between the antennal sockets slightly larger than the distance between a socket and the adjacent orbit, and the dorsal length of flagellomere I equal to  $2.3\text{--}2.6 \times$  apical width.

The male can be recognized by the following combination of characters: sternum VIII with an unsculptured swelling basally, emarginate apically (Fig. 174); ocellocular distance equal to  $1.1-1.4 \times$  hindocellar diameter; propleuron closely punctate; propodeal dorsum irregularly obliquely ridged and with punctures between ridges, and short transverse ridges emerging from the longitudinal carina that separates the dorsum from the side (carina ill defined in some specimens). Additionally, the dorsal length of flagellomere I is  $1.7-1.8 \times$  apical width and the sterna are punctate throughout. *Pison batavum* is closely similar, but differs in having the punctures of sternum III 1-2 diameters apart mesally, sternum VIII markedly emarginate apically, with the apicolateral corner obtuse (Fig. 188), and the propodeal dorsum with a narrow glabrous area along the midline (the area widens toward the anterior margin, near which it is about  $2 \times$  midocellar diameter wide); in *P. barbatus*, the punctures of sternum III are 2-3 diameters apart mesally, the emargination of sternum VIII is shallow and its apicolateral corner is acute (Fig. 174), and the propodeal dorsum has no glabrous area.

**SEX ASSOCIATION.**—The previously unknown male is associated with the female because both sexes are morphologically similar and because they were the only *Pison* collected on Blacks Beach near Mackay.

**DESCRIPTION.**—Frons dull, finely punctate, punctures compressed against each other. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart (Fig. 172); a few punctures near center may be about one diameter apart. Mesopleural punctures compressed. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area towards spiracle (carina ill defined in some specimens); dorsum irregularly, obliquely ridged, punctate between ridges; side ridged, punctate between ridges (ridges becoming evanescent ventrad); posterior surface ridged. Punctures of tergum I about one diameter apart, nearly contiguous on apical depression. Sterna punctate throughout.

Setae silvery, appressed on upper frons, thorax, and tergum I, completely concealing integument on clypeus.

Head, thorax, propodeum, legs, and gaster black, mandible reddish preapically.

♀.—Upper interocular distance equal to  $0.50-0.52 \times$  lower interocular distance; distance between antennal sockets about  $2.5 \times$  socket width; ocellocular distance and distance between hindocelli equal to  $0.3-0.9 \times$  and  $1.1 \times$  hindocellar diameter, respectively; eye height equal to  $0.86-0.88 \times$  distance between eye notches. Clypeal lamella as long mesally as laterally, distance between its corners  $1.7-1.9 \times$  distance between corner and adjacent orbit (Fig. 169). Distance between antennal sockets slightly larger than distance between socket and adjacent orbit. Dorsal length of flagellomere I  $2.3-2.6 \times$  apical width, of flagellomere IX  $1.2-1.4 \times$  apical width. Gena (Fig. 171), mandibular posterior margin, propleural and forecoxal outer margin, and foretrochanteral and forefemoral venters (Fig. 172) with psammophores (longest setae of genal psammophore about  $1.0 \times$  greatest forefemoral width, of mandibular psammophore about  $1.2 \times$  greatest forefemoral width, of forefemoral psammophore about  $0.7 \times$  greatest forefemoral width); lower gena impunctate and aetose between oral fossa and psammophore. Mandible: trimmal carina with incision at about midlength. Length 7.0-7.8 mm; head width 5.4-5.5 mm.

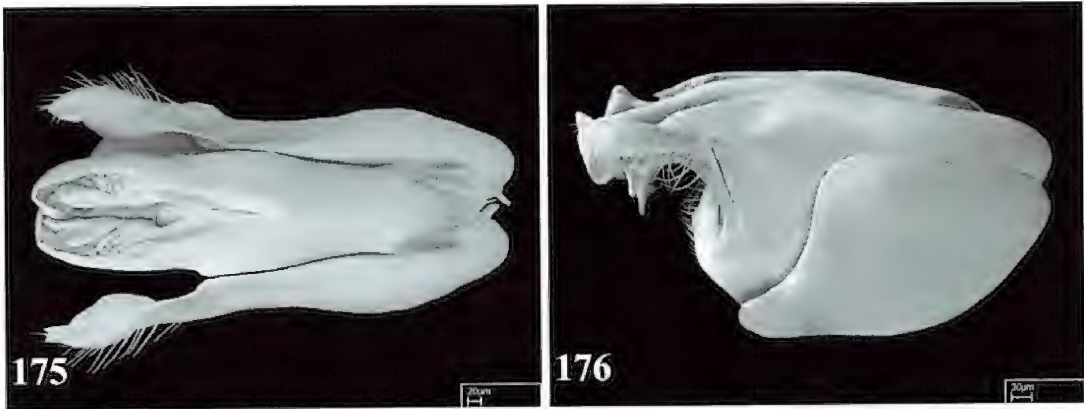
♂.—Upper interocular distance equal to  $0.76-0.78 \times$  lower interocular distance; ocellocular distance and distance between hindocelli equal to  $1.1-1.4 \times$  and  $1.2-1.5 \times$  hindocellar diameter, respectively; eye height equal to  $0.86-0.88 \times$  distance between eye notches. Free margin of clypeal





FIGURES 169–174. *Pison barbatum* Evans. (169) Female clypeus and mandibles; (170) Male clypeus and mandibles; (171) Genal psammophore of female; (172) Forefemoral psammophore of female; (173) Female tegula and adjacent scutum; male; (174) Sternum VIII (ventral surface).





FIGURES 175–176. *Pison barbatus* Evans, male. (175) Genitalia in dorsal view; (176) Genitalia in lateral view.

lamella acutely angulate (Fig. 170). Dorsal length of flagellomere I  $1.7\text{--}1.8 \times$  apical width, of flagellomere X  $0.9\text{--}1.0 \times$  apical width. Sternum VIII with unsculptured swelling basally, broadly emarginate apically (Fig. 174). Genitalia: Figs. 175, 176. Length 5.3–6.8 mm; head width 1.8–2.2 mm.

**PREY.**— Evans (1981) took a female of this species with her prey, a male spider of the genus *Oxyopes* (Oxyopidae).

**GEOGRAPHIC DISTRIBUTION** (Fig. 177).— Northern parts of Northern Territory, of Queensland, and of Western Australia, also southern part of South Australia.

**RECORDS.**— **AUSTRALIA: Northern Territory:** Gregory National Park: Victoria River bank near Victoria River Roadhouse at  $15^{\circ}36.8'S$   $131^{\circ}08.7'E$  (1 ♂, CAS), 28 km SE Katherine at  $14^{\circ}34.0'S$   $132^{\circ}28.5'E$  (2 ♀, CAS), 19 km ENE Mount Cahill at  $12^{\circ}47'S$   $132^{\circ}51'$ . **Queensland:** Blacks Beach ca 8 km N Mackay at  $21^{\circ}03.6'S$   $149^{\circ}11.7'E$  (1 ♀, 4 ♂, CAS), Hann River at  $15^{\circ}11'S$   $143^{\circ}52'E$  (1 ♀, ANIC), Port Douglas (2 ♀, QMB, holotype and paratype of *barbatum*). **South Australia:** Calperum Station 14 km WNW Renmark at  $34^{\circ}07'S$   $140^{\circ}37'E$  (1 ♀, ANIC). **Western Australia:** Drysdale River at  $15^{\circ}02'S$   $126^{\circ}55'E$  (2 ♀, ANIC).



FIGURE 177. Collecting localities of *Pison barbatus* Evans.

### *Pison basale* F. Smith

Figures 178–185.

*Pison basale* F. Smith, 1869:292, ♀ (as *basalis*, incorrect original termination). Lectotype: ♀, Australia: no specific locality (BMNH), **present designation**, examined. — Kohl, 1885:186 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:710 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*, as *basalis*), 615 (recognition characters); R. Bohart and Menke, 1976:337 (in checklist of world Sphecidae); Cardale, 1985:258 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Smith (1869) did not indicate the number of specimens examined in the original description of *P. basale*. I have designated as the lectotype of this species the only female present in The Natural History Museum, London.

**RECOGNITION.**—*Pison basale* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, the setae appressed on the scutum and tergum I, the female gena punctate and setose adjacent to the hypostomal area, and tergum I (except basally) and tergum II (at least partly) ferruginous. It differs from similar species in having the tegula obtusely pointed apically (Fig. 181) rather than rounded, and the occipital carina slightly expanded ventrally (carina height about  $0.5 \times$  midocellar diameter). *Pison auratum* is similar, but in that species the female clypeus is shallowly concave adjacent to the lamella (rather than slightly convex), and male sternum VIII is deeply emarginate apically (rather than slightly so or truncate); also, tergum II is black in most specimens. Also similar is *P. formosum*, in which only tergum III is black, the remaining terga being ferruginous (in *P. basale*, at least terga III and IV are black), the clypeal lamella of the female is wider (compare Figs. 178 and 452), and the ocellocular distance in the male is equal to  $1.8\text{--}2.1 \times$  hindocellar diameter ( $1.1\text{--}1.2 \times$  hindocellar diameter in *P. basale*). Unlike *P. lutescens*, the middle supraantennal carina of *P. basale* is well defined (rather than evanescent), and the free margin of the female clypeus is distinctly concave adjacent to orbit (rather than barely concave).

**DESCRIPTION.**—Frons dull, finely, shallowly punctate, punctures averaging about one diameter apart. Occipital carina slightly expanded ventrally, its height about  $0.5 \times$  midocellar diameter. Labrum emarginate mesally. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Punctures of propleuron either all less than one diameter apart or more than one diameter apart in anterior half. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal and mesopleural punctures well defined, less than one diameter apart, interspaces unsculptured. Tegula enlarged, obtusely pointed apically (Fig. 181). Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent in most specimens); dorsum densely punctate (punctures nearly contiguous), interspaces merging into minute, irregularly oblique ridges (ridges becoming more conspicuous toward dorsum basomedian point); side punctate, interspaces linear, merging into minute ridges; posterior surface ridged and punctate. Posteroventral forefemoral surface closely punctate. Hindcoxal dorsum with outer margin carinate apically. Length of tergum I slightly more than apical width in some males; punctures on horizontal part about one diameter apart. Sterna finely punctate throughout, punctures of sternum II more than one diameter apart mesally.

Setae either silvery or golden on head (Fig. 180), thorax, and propodeum, but intermediate in some specimens (e.g., silvery on clypeus and golden on frons), suberect on upper frons, appressed on scutum (a few, sparse setae are erect) and tergum I, sinuous on lower gena; on frons oriented ventrally in ventral half, oriented dorsolaterally in dorsal half mesally; partly concealing integument on clypeus in female, completely so (except lamella) in male; setal length, expressed as a fraction of midocellar diameter, up to  $1.0 \times$  on frons in female,  $0.5 \times$  in male, up to about  $1.3 \times$  on lower gena in female,  $1.0 \times$  in male. Apical depressions of terga with setal fasciae, fasciae either silvery or golden, but dark brown on terga III–VI in one male examined.

Head, thorax, and propodeum black, female clypeus ferruginous next to lobe free margin; mandible narrowly black basally and apically, yellowish reddish mesally; scape, pedicel, and flagellomeres I–II to I–VII ferruginous (apical flagellomeres black). Femora all ferruginous or midfemur partly and hindfemur mainly black, tibiae, and tarsi ferruginous. Tergum I ferruginous (black basally), tergum II ferruginous (all or partly), at least terga III and IV black (remaining terga either all black or largely ferruginous).

♀.—Upper interocular distance equal to  $0.64\text{--}0.70 \times$  lower interocular distance; ocellocular



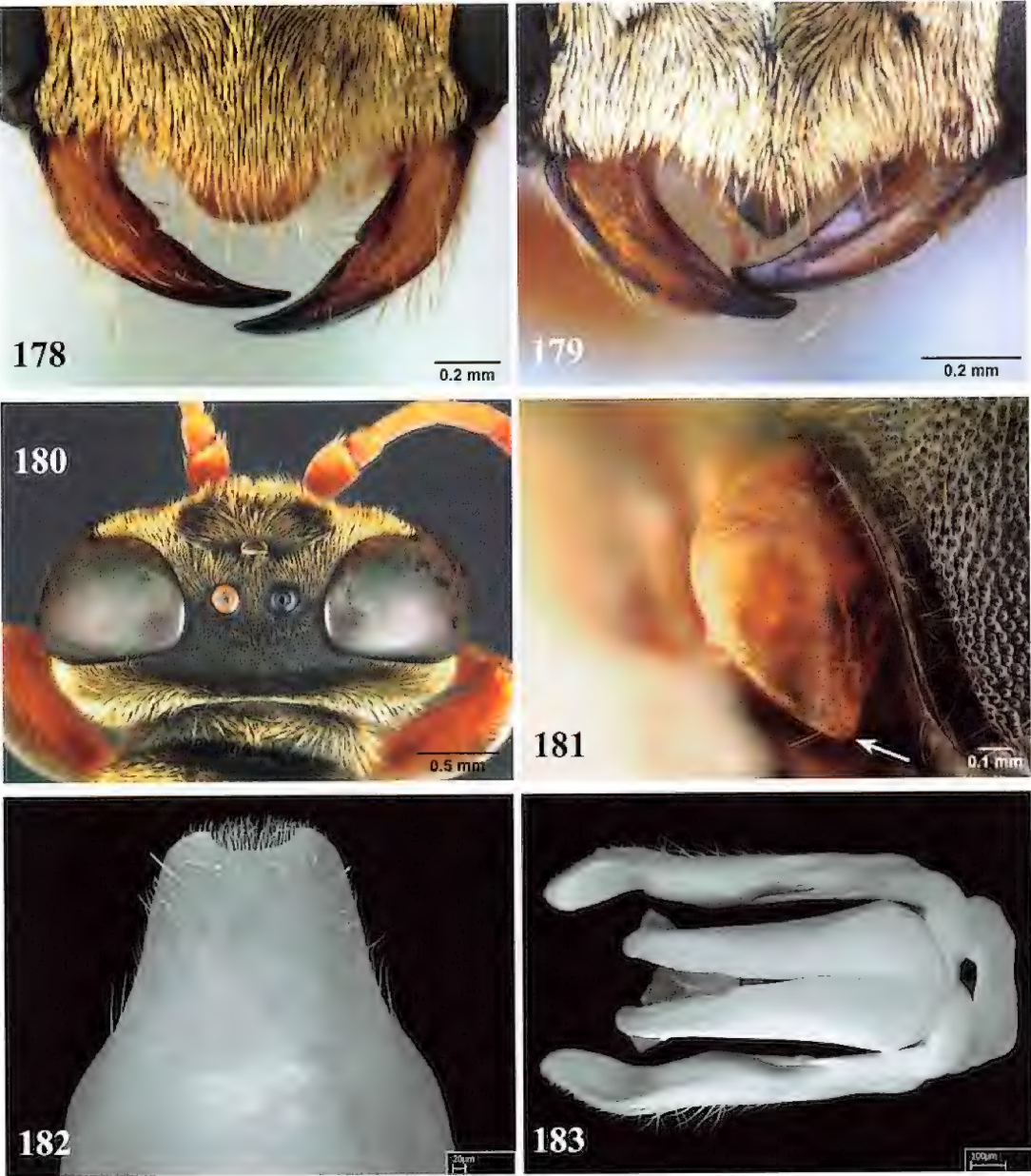


FIGURE 178–183. *Pison basale* F. Smith. (178) Female clypeus and mandibles; (179) Male clypeus and mandibles; (180) Female head in dorsal view; (181) Tegula and adjacent scutum (arrow shows obtusely pointed posterior end of tegula); male; (182) Sternum VIII (ventral surface); (183) Genitalia in dorsal view.



distance equal to  $0.8-1.1 \times$  hindocellar diameter, distance between hindocelli  $0.8-1.1 \times$  hindocellar diameter; eye height equal to  $0.92-0.94 \times$  distance between eye notches. Free margin of clypeal lamella roundly angulate, clypeal lobe narrow (Fig. 178). Dorsal length of flagellomere I  $2.2-2.6 \times$  apical width, of flagellomere IX  $1.4-1.8 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 8.7-9.8 mm; head width 2.3-3.7 mm.

♂.— Upper interocular distance equal to  $0.78-0.80 \times$  lower interocular distance; ocellocular distance equal to  $1.0-1.4 \times$  hindocellar diameter, distance between hindocelli  $1.0-1.5 \times$  hindocellar diameter; eye height equal to  $0.96-1.02 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 179). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically to truncate (Fig. 182). Genitalia: Figs. 183, 184. Length 6.1-8.3 mm; head width 1.9-2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 185).— New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **AUSTRALIA:** **New South Wales:** 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (1 ♀, 2 ♂, CAS), Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$  (2 ♀, CAS). **Northern Territory:** Arnhem Highway crossing Mary River at  $12^{\circ}53'S$   $131^{\circ}38'E$  (1 ♂, NTM), Bridge Creek 32 km N Adelaide River (1 ♂, USNM), Gregory National Park at  $16^{\circ}01'45''S$   $130^{\circ}47'36''E$  (1 ♂, ANIC). **Queensland:** Agnes Water 40 km E Miriam Vale (1 ♂, AMS), Biggenden (2 ♂, ANIC), Brisbane (1 ♀, 1 ♂, QMB), Brisbane: Blunder Creek (1 ♂, QMB), Bundaberg (2 ♀, ANIC), Bundaberg: Baldwin Swamp (1 ♀, ANIC), Burleigh (1 ♂, QMB), Burnett River at Bundaberg (1 ♀, ANIC), Carnarvon National Park: Carnarvon Gorge (2 ♀, QMB), 9 km S Dingo Beach at  $20^{\circ}05.5'S$   $148^{\circ}30.2'E$  (1 ♂, CAS), Dipperu National Park at  $21^{\circ}53.9'S$   $148^{\circ}56.5'E$  (2 ♂, CAS), Hayes Creek at  $13^{\circ}35.0'S$   $131^{\circ}27.6'E$  (1 ♀, CAS), Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$  (7 ♀, 17 ♂, CAS), Ipswich (1 ♀, QMB), Kuranda (2 ♀, BMNH), Maryborough at  $25^{\circ}32'S$   $152^{\circ}44'E$  (1 ♀, ANIC), 10 km S Moreton in Cape York Peninsula (1 ♂, ANIC), 48 km E Mount Surprise at  $18^{\circ}09.0'S$   $144^{\circ}43.6'E$  (1 ♀, CAS), Musgrave (1 ♂, AMS), North Stradbroke Island (1 ♀, QMB), Pendland at  $20^{\circ}31.0'S$   $145^{\circ}24.2'E$  (1 ♀, CAS), 61 km S Rolleston at  $24^{\circ}59.7'S$   $148^{\circ}27.8'E$  (15 ♂, CAS), The Bend 3 km NW Coen at  $13^{\circ}56'S$   $143^{\circ}12'E$  (1 ♀, ANIC), Townsville (1 ♀, SAM). **South Australia:** Bullinina Dam 45 km NE Marree (1 ♂, SAM), Coopers Creek ferry crossing (2 ♀, SAM). **Western Australia:** Mining Camp in Mitchell Plateau at  $14^{\circ}49'S$   $125^{\circ}50'E$  (1 ♀, ANIC). **No specific locality** (1 ♀, BMNH, lectotype of *Pison basale*).



FIGURE 184. *Pison basale* F. Smith, male. (184) Genitalia in lateral view.



FIGURE 185. Collecting localities of *Pison basale* F. Smith.

*Pison batavum* Pulawski, species nova

Figures 186-191.

**NAME DERIVATION.**—*Batavus* (neuter: *batavum*) is a Latin neuter adjective meaning of *Batavia* (Roman name for the region in the Netherlands nowadays known as Betuwe); with reference to the origin of the holotype near the Batavia Downs Homestead in Queensland.

**RECOGNITION.**—*Pison batavum* is an all black species, with three submarginal cells, second recurrent vein interstitial with the second intersubmarginal vein, and setae appressed on the scutum and tergum I. The female is unknown. In the male, the clypeal lamella is acutely angulate, the ocellular distance is equal to  $1.2 \times$  hindocellar diameter, the flagellomeres are cylindrical and without tyloids, the tegula is largely impunctate, the scutal punctures are slightly more than one diameter apart on each side of the scutal center, the propodeal dorsum is ridged (with the ridges more conspicuous adjacent to the longitudinal carina that separates the side from the dorsum and posterior surface, the latter carina somewhat ill defined), the sterna are punctate throughout, and sternum VIII is evenly emarginate apically (emargination not unusually deep). *Pison barbatum* is similar, but *P. batavum* differs in having the punctures of sternum III 1-2 diameters apart mesally, sternum VIII markedly emarginate apically, with the apicolateral corner obtuse (Fig. 188), and the propodeal dorsum with a narrow glabrous area along the midline (the area widens toward the anterior margin, near which it is about  $2 \times$  midocellar diameter wide). In *P. barbatum*, the punctures of sternum III are 2-3 diameters apart mesally, the emargination of sternum VIII is shallow and the apicolateral corner is acute (Fig. 174), and the propodeal dorsum has no glabrous area.

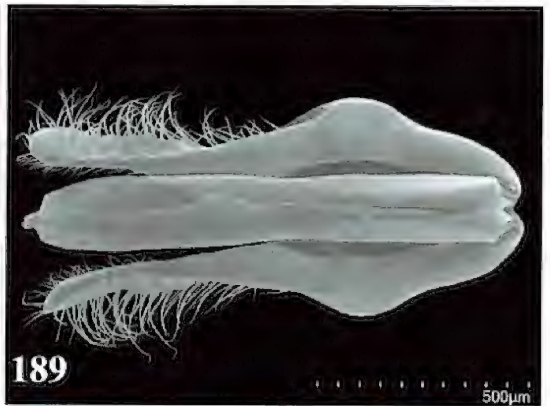
**DESCRIPTION.**—Frons dull, finely punctate, punctures somewhat ill defined, about one diameter apart. Gena narrow in dorsal view (Fig. 187). Labrum slightly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures relatively fine, slightly more than one diameter apart on each side of scutal center. Tegula slightly enlarged. Mesopleural punctures less than one diameter apart, interspaces dull. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with somewhat ill-defined irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges becoming more conspicuous adjacent to longitudinal carina); side irregularly ridged, punctate between ridges; posterior surface conspicuously ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I mesally more than one diameter apart anterior to apical depression. Sterna punctate throughout, on sternum II punctures 1-2 diameters apart mesally.

Setae silvery, appressed on postocellar area, scutum, and tergum I, oriented ventrally on frons, completely concealing integument on clypeus (except lamella); on lower gena suberect to erect, straight but curved apically, shorter than midocellar diameter. Propodeal dorsum with longitudinal glabrous area that becomes wider toward anterior margin (where it is about  $2 \times$  as wide as midocellar diameter). Apical depressions of terga with silvery setal fasciae.

Body all black.

♀.—Unknown

♂.—Upper interocular distance equal to  $0.80-0.82 \times$  lower interocular distance; ocellular distance equal to  $1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.00-1.02 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 186). Dorsal length of flagellomere I  $2.2-2.3 \times$  apical width, of flagellomere X  $1.3-1.4 \times$  apical width. Sternum VIII markedly emarginate apically, apicolateral corner obtuse (Fig. 188). Genitalia: Figs. 189, 190. Length 6.0-7.2 mm; head width 1.9-2.3 mm.



FIGURES 186–190. *Pison batavum* Pulawski, sp. nov., male. (186) Clypeus; (187) Head in dorsal view; (188). Sternum VIII (ventral surface); (189) Genitalia in dorsal view; (190) Genitalia in lateral view.  
FIGURE 191. Collecting localities of *Pison batavum* Pulawski, sp. nov.



**GEOGRAPHIC DISTRIBUTION** (Fig. 191).— Queensland, South Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: **Queensland:** 7 km S Batavia Downs at 12°43'S 142°42'E, 22 June – 23 Aug 1992, P. Zborowski and J. C. Cardale (ANIC).

PARATYPES: AUSTRALIA: **Queensland:** same data as holotype (1 ♂, ANIC); 4 km NE Batavia Downs at 12°39'S 142°42'E, 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (1 ♂, CAS); Box Creek 16 km N Proserpine, 12 Apr 1975, G.A. Holloway (1 ♂, AMS); Hann River at 15°11'S 143°52'E, 17 Nov – 18 Dec 1993, P. Zborowski and J.C. Cardale (1 ♂, CAS); 13 km SE Weipa at 12°40'S 143°00'E, 14 July – 15 Aug 1993, P. Zborowski and J.C. Cardale (1 ♂, CAS). **South Australia:** Aroona at 31°17'S 138°35'E, 9 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♂, ANIC).

***Pison bicellulare* Pulawski, species nova**

Figures 192-196.

**NAME DERIVATION.**— From the Latin prefix *bis-*, meaning *two*, and *cellularis* (neuter: *cellulare*), *cellular*; with reference to the presence of only two submarginal cells in this species.

**RECOGNITION.**— *Pison bicellulare* is all black (including the mid- and hindtibial spurs), with two submarginal cells (Fig. 193), the posterior margin of the second submarginal cell equal to 1.7-1.8 × its height, the tegula finely punctate throughout, the eye asetose, and the propodeal dorsum without carinae bordering the enclosure. In the female (the male is unknown), the integument is depressed between the postspiracular carina and the episternal sulcus (Fig. 194), a feature shared with *P. aberrans* and *P. incurvatum*. Unlike these species, however, the scutum of *P. bicellulare* lacks short longitudinal ridges adjacent to its posterior margin.

**DESCRIPTION.**— Frons slightly swollen above antennal socket, dull, minutely punctate, punctures less than one diameter apart. Distance between antennal socket and orbit slightly smaller than socket width. Gena narrow in dorsal view (Fig. 193). Labrum emarginate mesally. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum slightly foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Scutellum inconspicuously foveate along anterior margin. Tegula enlarged, minutely punctate throughout, nearly entirely covering humeral plate. Mesopleural punctures fine, averaging about one diameter apart; interspaces inconspicuously microsculptured. Postspiracular carina present, slightly longer than midocellar diameter; integument depressed between postspiracular carina and episternal sulcus (Fig. 194). Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges evanescent laterally); side punctate, with or without ridges anteriorly; posterior surface transversely ridged, punctate between ridges. Forewing with two submarginal cells (Fig. 195); posterior margin of second submarginal cell equal to 1.7-1.8 × its height. Hindcoxa dorsum with outer margin obtusely carinate. Punctures of tergum I fine, less than one diameter apart. Sterna finely punctate throughout, punctures of sternum II 1-2 diameters apart mesally.

Setae silvery, appressed on frons, postocellar area, scutum, and tergum I; inconspicuous on frons, not concealing integument on clypeus; straight; on lower gena straight, almost appressed, shorter than midocellar diameter. Apical depressions of terga II and III with silvery, setal fasciae.

Body black, mandible dark reddish in apical half; mid- and hindtibial spurs black.

♀.— Upper interocular distance equal to 0.96-0.98 × lower interocular distance; ocellocular distance equal to 0.9-1.2 × hindocellar diameter, distance between hindocelli equal to 1.2 × hindocellar diameter; eye height equal to 1.00-1.06 × distance between eye notches. Free margin of clypeal lamella with minute, obtuse median point (Fig. 192). Dorsal length of flagellomere I



FIGURES 192–195. *Pison bicellulare* Pulawski, sp. nov., female. (192) Clypeus; (193) Head in dorsal view; (194) Thorax in lateral view (arrow shows depressed area of mesopleuron); (195) Distal part of forewing.

FIGURE 196. Collecting localities of *Pison bicellulare* Pulawski, sp. nov.



1.5–1.9 × apical width, of flagellomere IX  
1.0–1.1 × apical width. Mandible: trimmal cari-  
na with small incision at about apical two  
thirds of length. Length 5.5–6.6 mm; head  
width 1.5–1.6 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 196).—

Known from Australian Capital Territory and Tasmania.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Australian Capital Territory: Blundells Creek at 35°22'S  
148°50'E, Feb 1987, D.H. Colless (ANIC).

PARATYPES: AUSTRALIA: Australian Capital Territory: same locality and collector, Feb 1987 (2 ♀,  
ANIC; 1 ♀, CAS), Jan 1988 (1 ♀, CAS). Tasmania: Lawceston, 14 Feb 1914, no collector (1 ♀, SAM).

*Pison bimbi* Pulawski, species nova

Figures 197-200.

**NAME DERIVATION.**— *Bimbi* means *bird* in the Ngunnawal language of the aboriginal Australians who inhabited the Australian Capital Territory area (where one of the specimens was collected); a noun in apposition to the generic name.

**RECOGNITION.**— The female of *Pison bimbi* (the male is unknown) has only two submarginal cells, the second one elongate (length of posterior margin  $1.8-2.0 \times$  height). The eye is asetose, the gaster is black, the legs are ferruginous, and the tegula is unsculptured posterolaterally. Furthermore, tergum I is not elongate (length no more than apical width), the free margin of the clypeal lamella is evenly rounded (without median point), and the ocellocular distance is smaller than the hindocellar diameter and the interocellar distance (Fig. 198). An aberrant *P. prostratum* with two submarginal cell is similar, but *P. bimbi* differs by the following: all frontal setae are oriented dorsally, the pronotal collar is swollen, elongate dorsally, the postspiracular carina is absent, the scutum has no longitudinal ridges adjacent to the posterior margin, the mesopleural vestiture does not conceal the integument, the posteroventral forefemoral surface is impunctate, and the wing membrane is yellowish. In *P. prostratum* the frontal setae are oriented ventrally in the ventral half, whereas the dorsally oriented setae form a pair of patches just below the midocellus, the pronotal collar is neither swollen nor elongate, the postspiracular carina is present, the scutum has well-defined ridges adjacent to the posterior margin, the mesopleural vestiture conceals the integument, the posteroventral forefemoral surface is all punctate, and the wing membrane is hyaline.

**DESCRIPTION.**— Head subspherical in dorsal view. Frons shiny, finely punctate, punctures less than one diameter apart; middle supraantennal carina absent. Distance between antennal socket and orbit slightly smaller than socket width. Gena relatively narrow in dorsal view (Fig. 198). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Pronotal collar swollen, elongate dorsally (Fig. 199). Propleuron sparsely punctate near center. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Scutellum foveate along anterior margin. Tegula enlarged. Mesopleural punctures fine but slightly larger than those on scutum, less than one diameter apart. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, obliquely ridged; side minutely ridged, punctate between ridges; posterior surface minutely punctate (punctures contiguous, interspaces merging into minute ridges), with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Forewing with two submarginal cells; length of posterior margin of second submarginal cell  $1.8-2.0 \times$  height. Posteroventral forefemoral surface unsculptured (except apically). Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I well defined and about one diameter apart anterior to apical depression. Sterna punctate throughout, punctures of sternum II slightly more than one diameter apart mesally.

Setae silvery, appressed and extremely short on frons, postocellar area, gena, thorax, and tergum I, largely concealing integument on clypeus. Apical depressions of terga without setal fasciae.

Head, thorax, propodeum, and gaster black; mandible yellow in basal third, light brown mesally, dark apically; antenna yellowish brown, dark dorsally, apical flagellomere all dark. Femora, tibiae, and tarsi ferruginous.

♀.— Upper interocular distance equal to  $1.0 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5 \times$  hindocellar diame-





197



198



199



200

FIGURES 197–299. *Pison bimbi* Pulawski, sp. nov., female. (197) Clypeus and mandibles; (198) Head in dorsal view; (199) Pronotum in dorsal view.

FIGURE 200. Collecting localities of *Pison bimbi* Pulawski, sp. nov.

ter; eye height equal to  $1.02\text{--}1.04 \times$  distance between eye notches. Free margin of clypeal lamella evenly rounded (Fig. 197). Dorsal length of flagellomere I  $1.4\text{--}1.6 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width (flagellomere I shorter than pedicel). Mandible: trimmal carina without incision (Fig. 197). Length 4.6–6.3 mm; head width 1.2–1.5 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 200).—Known from one locality in New South Wales and another in the Australian Capital Territory.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: New South Wales: 16 km N Mudgee, 29 Nov 1982, D.S. Horning (ANIC).

PARATYPE: AUSTRALIA: Australian Capital Territory: Black Mountain at  $15^{\circ}16'S$   $149^{\circ}06'E$ , M.E. Irwin (1 ♀, CAS).

### *Pison brachyceras* Pulawski, species nova

Figures 201–209.

**NAME DERIVATION.**—*Brachyceras* is derived from two Greek words: *βραχῦς*, short, and *κέρας*, a horn (here in the meaning of antenna), a noun in apposition to the generic name; with reference to the short flagellomere I of this species.

**RECOGNITION.**—*Pison brachyceras* is an all black species, small to medium size (length 5.3–7.8 mm in female, 5.4–5.9 mm in male), with three submarginal cells, the second recurrent vein

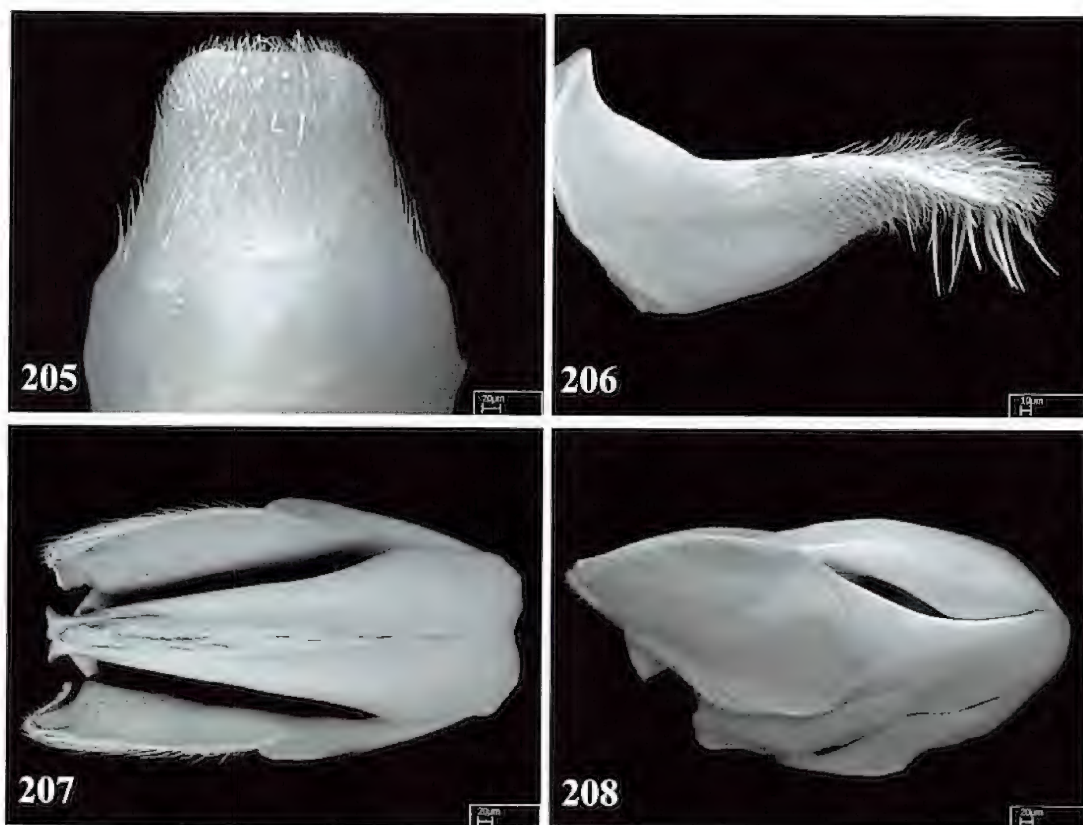
interstitial with the second intersubmarginal vein or nearly so, the tegula partly impunctate and asetose, and the setae appressed on tergum I. It is characterized by the setae of the lower gena appressed or subappressed, slightly shorter than midocellar diameter, the absence of the carina between the dorsum and side of the propodeum, a short flagellomere I (dorsal length  $1.5\text{--}1.7 \times$  apical width in female,  $1.4\text{--}1.5 \times$  in male), slightly shorter than to as long as flagellomere II (Fig. 204), and male sternum VIII rounded apicolaterally (Fig. 205). The female has an obtusely angulate to roundly angulate clypeal lamella (Fig. 201). Unlike *P. contiguum*, the scutal punctures of *P. brachyceras* are separate by small interspaces, the punctures of sterna II and III are minute, 1-2 diameters apart, and the legs are black (in *P. contiguum*, the scutal punctures are contiguous, the punctures of sterna II and III are conspicuous, up to several diameters apart mesally, and the mid- and hindtibiae and tarsi are dark ferruginous). Also similar is *P. angustivertex*, but in *P. brachyceras* the ocellocular distance is equal to  $0.8\text{--}1.3 \times$  hindocellar diameter in the female (Fig. 203) and  $1.4\text{--}1.7 \times$  in the male rather than  $0.3\text{--}0.5 \times$  (occasionally  $1.0 \times$ ) and  $0.9\text{--}1.0 \times$ , respectively, and the dorsal length of flagellomere I is  $1.5\text{--}1.7 \times$  apical width in the female and  $1.4\text{--}1.5 \times$  in the male rather than  $1.8\text{--}2.0$  and  $1.6\text{--}2.0$ , respectively.

**DESCRIPTION.**—Frons slightly swollen above antennal socket, dull, finely, shallowly punctate, punctures less than one diameter apart. Labrum broadly, shallowly emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine but



FIGURES 201–204. *Pison brachyceras* Pulawski, sp. nov. (201) Female clypeus and mandibles; (202) Male clypeus and mandibles; (203) Female head in dorsal view; (204) Basal flagellomeres of female.





Figures 205-208. *Pison brachyceras* Pulawski, sp. nov., male. (205) Sternum VIII (ventral surface); (206) Sternum VIII in lateral view; (207) Genitalia in dorsal view; (208) Genitalia in lateral view.

well defined, less than one diameter apart; interspaces microsculptured. Tegula slightly enlarged. Mesopleural punctures less than one diameter apart. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus slightly costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, punctate between ridges, with middle carina in shallow sulcus; side punctate and ridged; posterior surface conspicuously ridged, punctate between ridges. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I about one diameter apart. Sternum II punctate throughout.

Setae silvery, appressed or subappressed on lower gena and scutum, appressed on tergum I, shorter than midocellar diameter on gena; not concealing integument on clypeus in female, partly concealing in male. Apical depressions of terga with silvery, setal fasciae.

Body all black, but mandible brown to ferruginous (except basally and apically), flagellum brown ventrally in many specimens, and clypeal lamella brown or ferruginous in some females.

♀.— Upper interocular distance equal to  $0.78\text{--}0.84 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter (Fig. 203); eye height equal to  $0.96\text{--}1.00 \times$  distance between eye notches. Free margin of clypeal lamella varying from obtusely angulate (Fig. 201) to roundly arcuate. Dorsal length of flagellomere I  $1.5\text{--}1.7 \times$  apical width, of flagellomere IX  $1.0\text{--}1.1 \times$  apical width; flagellomere I slightly shorter than to as long as flagellomere II. Mandible: trimmal carina with small incision shortly beyond midlength. Length 5.3–8.6 mm; head width 1.6–2.3 mm.



♂.— Upper interocular distance equal to  $0.92\text{--}1.02 \times$  lower interocular distance; ocellocular distance equal to  $1.4\text{--}1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.92\text{--}0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 202). Dorsal length of flagellomere I  $1.4\text{--}1.5 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Sternum VIII convex basoventrally (Fig. 206), its apical margin minimally concave (Fig. 205). Genitalia: Figs. 207, 208; outer side of gonocoxite asetose (Fig. 206). Length 5.4–5.9 mm; head width 1.6–1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 209).—

New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA: Northern Territory:** Keep River National Park at  $15^{\circ}57'36''\text{S}$   $129^{\circ}01'38''\text{E}$ , 1–3 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

**PARATYPES:** **AUSTRALIA: New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'\text{S}$   $148^{\circ}40.5'\text{E}$ , 28 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Gilgandra Flora Reserve at  $31^{\circ}39.7'\text{S}$   $148^{\circ}46.3'\text{E}$ , 30 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Warrensburg National Park, 20 Dec 1987, M.E. Irwin (1 ♀, CAS). **Northern Territory:** Alice Springs at  $23^{\circ}41'\text{S}$   $133^{\circ}52'\text{E}$ , 6 Nov 1988, D. Rentz (3 ♀, ANIC); 39 km E Alice Springs at  $23^{\circ}41'\text{S}$   $134^{\circ}15'\text{E}$ , 5 Oct 1978, J.C. Cardale (1 ♀, ANIC); Caranbirini Waterhole 33 km SW Borroloola at  $16^{\circ}16'\text{S}$   $136^{\circ}05'\text{E}$ , 22 Apr 1976, D.H. Colless (1 ♀, ANIC); Entire Creek 155 km NE Alice Springs at  $22^{\circ}58'\text{S}$   $135^{\circ}09'\text{E}$ , 13 Oct 1978, J.C. Cardale (1 ♀, ANIC); Gregory National Park at  $15^{\circ}58'17''\text{S}$   $130^{\circ}29'17''\text{E}$ , 24 May 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS), at  $16^{\circ}03.7'\text{S}$   $130^{\circ}27.1'\text{E}$ , M.E. Irwin, F.D. Parker, and C. Lambkin, 6–12 June 2001 (1 ♂, ANIC; 1 ♀, CAS) and 12–16 June 2001 (1 ♀, ANIC; 1 ♀, CAS), at  $16^{\circ}03'44''\text{S}$   $130^{\circ}27'04''\text{E}$ , 24 May – 4 June 2001, T. Weir, K. Pullen, and P. Bouchard (2 ♀, CAS), at  $16^{\circ}06.7'\text{S}$   $130^{\circ}25.4'\text{E}$ , 5–12 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, 1 ♂, CAS), and at  $16^{\circ}10'49''\text{S}$   $130^{\circ}25'51''\text{E}$ , 16–18 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS); Keep River National Park at  $15^{\circ}47'49''\text{S}$   $129^{\circ}06'31''\text{E}$ , 3–6 June 2001, C. Lambkin, F.D. Parker, and M.E. Irwin (1 ♀, CAS), at  $15^{\circ}54'55''\text{S}$   $129^{\circ}04'11''\text{E}$ , 31 May – 3 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, 1 ♂, CAS) and at  $15^{\circ}57'33''\text{S}$   $129^{\circ}01'44''\text{E}$ , 3–8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (3 ♀, ANIC; 2 ♂, CAS). **Queensland:** Crediton State Forest at  $21^{\circ}11.8'\text{S}$   $148^{\circ}29.9'\text{E}$ , 1 Nov 2006, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 35 km N Cunnamulla, 27 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♀, QMB); Dalrymple National Park at  $19^{\circ}49.3'\text{S}$   $146^{\circ}05.3'\text{E}$ , 17 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); 9 km S Dingo Beach at  $20^{\circ}05.5'\text{S}$   $148^{\circ}30.2'\text{E}$ , 7 Nov 2006, W.J. Pulawski (1 ♀, CAS) and 12 and 26 Nov 2012, V. Ahrens and W.J. Pulawski (2 ♂, CAS); Eungella National Park, 16–19 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♀, QMB); Holts Creek 8 km N Musselbrook Camp at  $18^{\circ}33'\text{S}$   $138^{\circ}11'\text{E}$ , 10–20 May 1995, I.D. Naumann (1 ♂, ANIC); Homevale National Park at  $21^{\circ}26.9'\text{S}$   $148^{\circ}32.4'\text{E}$ , V. Ahrens and W.J. Pulawski, 4 Nov 2012 (1 ♀, 1 ♂, CAS), 27 Nov 2012 (4 ♂, CAS), and 28 Nov 2012 (2 ♀, CAS); Innot Hot Springs, 16 Jan 1999, M. Generani and P.L. Scaramozzino (1 ♀, CAS); Split Rock 14 km SE Laura at  $15^{\circ}39'\text{S}$   $144^{\circ}31'\text{E}$ , 26 Jun – 16 July 1993, K. Halfpapp and S. De Faveri (1 ♀, ANIC) and 29 Jun – 24 Aug 1992, P. Zborowski and J.C. Cardale (1 ♀, ANIC). **South Australia:** Gluepot Reserve at  $33^{\circ}46'48''\text{S}$   $139^{\circ}56'32''\text{E}$ , 26 Nov – 6 Dec 2000, Gluepot Survey (1 ♀, SAM); 31 km NW Renmark at  $33^{\circ}59'\text{S}$   $140^{\circ}30'\text{E}$ , 7 Nov – 13 Dec 1995, K.R. Pullen (1 ♀, ANIC). **Western Australia:** Karijini National Park at  $22^{\circ}28.4'\text{S}$   $118^{\circ}32.6'\text{E}$ , 5 Apr – 16 May 2003, F.D. Parker and M.E. Irwin (1 ♂, ANIC); 47 km S Pardoo Roadhouse at  $20^{\circ}22.7'\text{S}$   $120^{\circ}01.3'\text{E}$ , 1–14 May 2003, M.E. Irwin and F.D. Parker (1 ♂, CAS).



FIGURE 209. Collecting localities of *Pison brachyceras* Pulawski, sp. nov.

*Pison breviclypeatum* Pulawski, species nova

Figures 210-213.

**NAME DERIVATION.**— The name *breviclypeatum* is derived from two Latin words: *brevis*, short, and *clypeus*; with reference to the short clypeus of this species.

**RECOGNITION.**— *Pison breviclypeatum* has the second recurrent vein received near the middle of the second submarginal cell, a black gaster, with tergum I slightly shorter than wide apically, and the distance between the eye orbit and the antennal socket less than half the socket width. The female can be recognized by an unusually short clypeus (the lamella narrow, transverse, barely protruding beyond the free margin of the lateral section, Fig. 210), the head subspherical in dorsal view (Fig. 211), the upper interocular distance markedly larger ( $1.33\text{--}1.40\times$ ) than the lower interocular distance, a short flagellomere I (dorsal length  $1.5\text{--}1.7\times$  apical width), and terga with only inconspicuous, silvery setae. The male is unknown.

**DESCRIPTION.**— Head subspherical in dorsal view (Fig. 211). Frons dull, minutely punctate, punctures less than one diameter apart. Distance between antennal socket and orbit less than half socket width. Hypostomal and occipital carinae slightly expanded. Labrum emarginate. Ommatidia markedly larger in lower half of eye than those in dorsal half. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Scutum not foveate or inconspicuously foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Tegula slightly elongate. Mesopleural punctures fine but



FIGURES 210-212. *Pison breviclypeatum* Pulawski, sp. nov., female. (210) Clypeus; (211) Head in dorsal view; (212) Propodeal dorsum and posterior surface.

FIGURE 213. Collecting localities of *Pison breviclypeatum* Pulawski, sp. nov.



larger than those on scutum, at center about two diameters apart; interspaces microsculptured. Postspiracular carina present, about twice as long as midocellar diameter; integument depressed between postocellar carina and episternal sulcus. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with fine longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum minutely obliquely ridged (Fig. 212), finely punctate between ridges, with middle carina but without median sulcus; side punctate, with a few minute ridges near spiracle; posterior surface finely punctate, also finely transversely ridged in ventral half or so. Second recurrent vein joining second submarginal cell at or near its midlength. Hindcoxa dorsum with outer margin not carinate. Punctures of tergum I fine but well defined, averaging about one diameter apart on horizontal part. Sternum II punctate throughout, punctures 2-3 diameters apart mesally.

Setae silvery, appressed on frons, thorax, and tergum I, on lower gena suberect but not longer than one third of midocellar diameter; not concealing integument on clypeus; inconspicuous on terga.

Head, thorax, propodeum, and gaster black, antenna ferruginous (scape and apical flagellomeres darkened dorsally), mandible yellowish reddish mesally. Femora, tibiae, and tarsi ferruginous, forefemur black dorsally in holotype.

♀.—Upper interocular distance equal to  $1.33\text{--}1.40 \times$  lower interocular distance; ocellocular distance equal to  $0.5\text{--}0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}1.0 \times$  hindocellar diameter; eye height equal to  $0.98\text{--}1.00 \times$  distance between eye notches. Clypeal lamella transverse, narrow, barely protruding beyond free margin of lateral section (Fig. 210). Dorsal length of flagellomere I  $1.5\text{--}1.7 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Length 5.1–6.3 mm; head width 1.3–1.4 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (FIG. 213).—Eastern New South Wales, eastern Queensland.

**RECORDS**.—HOLOTYPE: ♀, AUSTRALIA: New South Wales: Wilson River Reserve 15 km NW Bellangry, 7 Dec 1986, D.J. Bickel (AMS).

PARATYPES: AUSTRALIA: Queensland: Crediton State Forest at  $21^{\circ}11.8'S$   $148^{\circ}29.9'E$ , 2 Nov 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$ , 5, 6, and 8 Nov 2012, V. Ahrens and W.J. Pulawski (3 ♀, CAS); Kuranda: Russet Park, 20 Oct 1987, T.W. Davies (1 ♀, CAS).

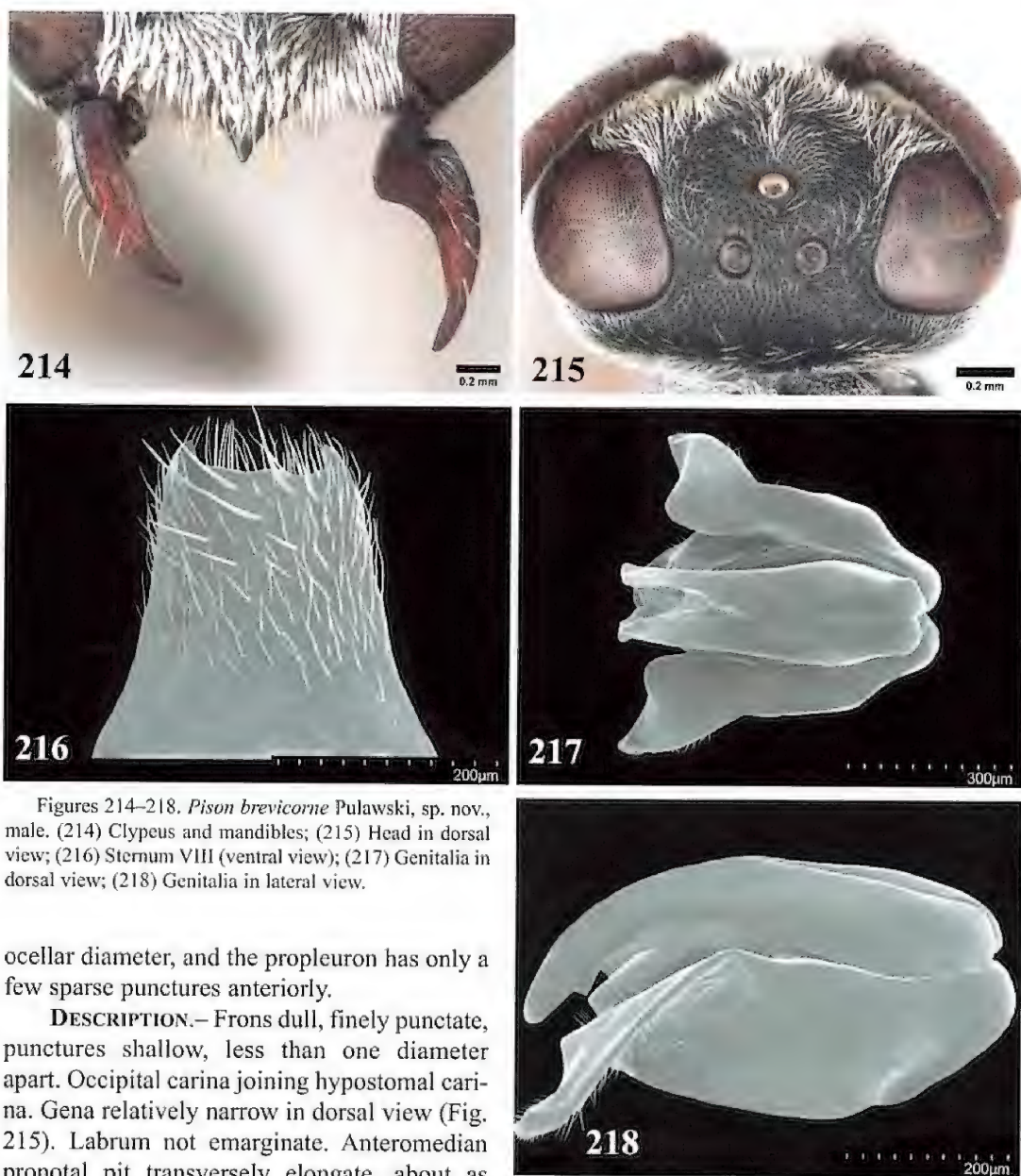
### *Pison brevicorne* Pulawski, species nova

Figures 214–219.

**NAME DERIVATION**.—*Brevicorne* derives from two Latin words: *brevis*, short, and *cornu*, a horn (here in the meaning of an antenna).

**RECOGNITION**.—The female of *Pison brevicorne* is unknown. The male is all black, small (length 5.4 mm), characterized by the presence of three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, the tegula partly impunctate and asetose, and the setae appressed on tergum I. Furthermore, the free margin of the clypeal lamella is acutely angulate, slightly concave on each side of the midpoint (Fig. 214, the flagellum is cylindrical, the tegula is largely impunctate, the propodeum lacks the longitudinal carina separating the side from the dorsum and the posterior surface, sternum VIII is shallowly, broadly emarginate apically, with an acute posterolateral corner (Fig. 216), and the other sterna unmodified. *Pison occidentale* is similar, but in *P. brevicorne* the dorsal length of flagellomere I is  $1.3 \times$  the apical width, the setae of the lower gena are appressed anteriorly, shorter than the midocellar diameter, and the propleuron is densely punctate. In *P. occidentale* the dorsal length of flagellomere I is  $1.8\text{--}1.9 \times$  apical width, the setae of the lower gena are subappressed, the longest ones slightly longer than the mid-





Figures 214–218. *Pison brevicorne* Pulawski, sp. nov., male. (214) Clypeus and mandibles; (215) Head in dorsal view; (216) Sternum VIII (ventral view); (217) Genitalia in dorsal view; (218) Genitalia in lateral view.

ocellar diameter, and the propleuron has only a few sparse punctures anteriorly.

**DESCRIPTION.**—Frons dull, finely punctate, punctures shallow, less than one diameter apart. Occipital carina joining hypostomal carina. Gena relatively narrow in dorsal view (Fig. 215). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart; interspaces aciculate. Tegula not enlarged. Mesopleural punctures well defined, markedly less than one diameter apart. Postspiracular carina present, about half as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina extending from gastral socket area toward spiracle; dorsum obliquely ridged in basal half, rugose apically; side minutely, densely ridged, punctate between ridges; posterior surface ridged, punctate between ridges, with several conspicuous ridges radiating up from gastropodeal articulation. Posteroventral forefemoral surface finely punctate, punctures about one diameter

apart. Hindcoxal dorsum with outer margin obtusely carinate basally. Punctures of tergum I well defined, mostly about one diameter apart (some punctures about two diameters apart). Sterna punctate throughout.

Setae silvery, suberect on upper frons and postocellar area, erect on scutum (setal length here about equal to  $0.5 \times$  midocellar diameter), appressed on tergum I; on lower gena appressed anteriorly, erect, straight or curved next to occipital carina where they are about  $0.7 \times$  as long as midocellar diameter; nearly completely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

♀.— Unknown.

♂.— Upper interocular distance equal to  $1.02 \times$  lower interocular distance; ocellocular distance and distance between hindocelli equal to  $1.5 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate, slightly concave on each side of midpoint (Fig. 214). Dorsal length of flagellomere I  $1.3 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically, posterolateral corner acute (Fig. 216). Genitalia: Figs. 217, 218. Length 5.4 mm; head width 1.5 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 219).— Known from one locality in northwestern part of Northern Territory.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: Northern Territory: Keep River National Park at  $16^{\circ}06'47''\text{S}$   $135^{\circ}25'24''\text{E}$ , 24 May – 4 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).



FIGURE 219. Collecting locality of *Pison brevicorne* Pulawski, sp. nov.

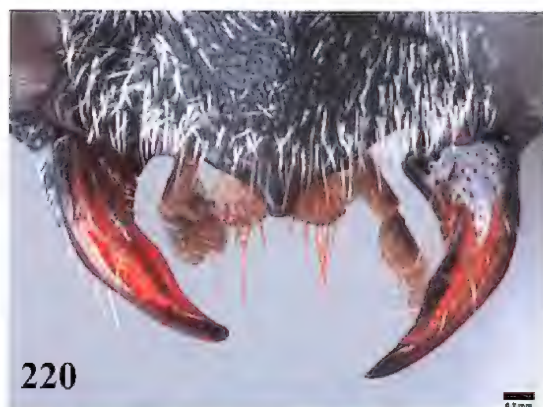
***Pison carinigerum* Pulawski, species nova**  
Figures 220-226.

**NAME DERIVATION.**— *Carinigerum* is derived from two Latin words: *carina* and the suffix *-ger* (neuter: *gerum*), *a bearer*; with reference to the carinate lower gena of this species.

**RECOGNITION.**— *Pison carinigerum* is unique within the genus in having conspicuous, oblique ridges on the lower gena (Fig. 222). The expanded hypostomal carina and the presence of an abductor ridge on the outer mandibular surface (Fig. 221) are subsidiary recognition features. The female is unknown.

**DESCRIPTION.**— Frons dull, finely, shallowly punctate, punctures less than one diameter apart. Hypostomal carina expanded, highest posteriorly (its greatest height about  $0.5 \times$  midocellar diameter). Gena narrow in dorsal view, lower gena with well-defined, oblique ridges emerging from hypostomal carina (Fig. 222). Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, averaging less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures well defined, nearly compressed against each other. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, obliquely ridged, punctate between ridges; side ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral





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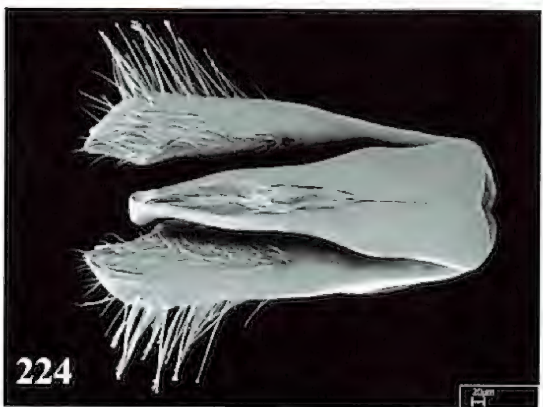
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FIGURES 220–225. *Pison carinigerum* Pulawski, sp. nov., male. (220) Clypeus and mandibles; (221) Left mandible, outer side (arrow shows abductor ridge); (222) Underside of male head in oblique view (arrow shows ridges on lower gena); (223). Sternum VIII (ventral view); (224) Genitalia in dorsal view; (225) Genitalia in lateral view.



forefemoral surface minutely, closely punctate. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I, on horizontal part, slightly more than one diameter apart anterior to apical depression. Sterna punctate throughout.

Setae silvery, appressed on upper frons (oriented ventrally), postocellar area, scutum, and tergum I; on lower gena suberect, straight (curved apically), about as long as  $0.6 \times$  midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible dark reddish mesally.

♀.—Unknown.

♂.—Upper interocular distance equal to  $0.80 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.02 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate, concave on each side of midpoint (Fig. 220). Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Mandible with abductor ridge (Fig. 221). Sternum VIII emarginate apically (Fig. 223). Genitalia: Figs. 224, 225. Length 6.7 mm; head width 2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 226).—Known from one locality in southern part of South Australia.

**RECORDS.**—HOLOTYPE: ♂, AUSTRALIA: South Australia: Port Clinton Conservation Park at  $34^{\circ}09.4'S$   $138^{\circ}03.2'E$ , 14 Dec 2010, V. Ahrens and W.J. Pulawski (SAM).



FIGURE 226. Collecting locality of *Pison carinigerum* Pulawski, sp. nov.

***Pison cicatricosum* Pulawski, species nova**  
Figures 227-233.

**NAME DERIVATION.**—*Cicatricosus* (neuter: *cicatricosum*) is a Latin adjective meaning *covered with scars*; with reference to the scar-like impressions adjacent to the antennal sockets.

**RECOGNITION.**—*Pison cicatricosum* is all black and has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, the tegula partly impunctate and asetose, and the setae sinuous, erect on the lower gena, and appressed on tergum I. It differs from all other species, except *P. congener*, in having, adjacent to the outer side of the antennal socket, an elongate, glabrous impression, markedly contrasting with the remaining, setose surface (Fig. 229). *Pison congener* has an identical structure, but *P. cicatricosum* differs in lacking the erect setae on tergum I (abundant erect setae present in *P. congener*) and in having the ocellocular distance equal to  $0.8 \times$  hindocellar diameter in the female and  $1.1 \times$  in the male (rather than  $1.2-1.3 \times$  and  $1.6-2.1 \times$ , respectively, in *P. congener*).

**DESCRIPTION.**—Frons dull, shallowly punctate (most punctures one diameter apart or more), with elongate, glabrous impression adjacent to outer side of antennal socket (Fig. 229), markedly contrasting with remaining, setose surface. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Propleuron sparsely punctate anteriorly. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart except about one diameter apart at center in female; interspaces unsculptured, shiny. Tegula enlarged, roundly angulate apically. Mesopleural punctures larger than those on scutum, less than one diameter apart; interspaces inconspic-



FIGURES 227–232. *Pison cicatricosum* Pulawski, sp. nov. (227) Female clypeus and mandibles; (228) Male clypeus and mandibles; (229) Lower frons of female (arrow show glabrous impression); male: (230) Sternum VIII (ventral surface); (231) Genitalia in dorsal view; (232) Genitalia in lateral view.



uously microareolate. Postspiracular carina present, about twice as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, punctate between ridges in female, in male punctate with interspaces merging into fine ridges; side punctate, interspaces merging into minute, inconspicuous ridges; posterior surface conspicuously, transversely ridged, punctate between ridges in female, in male punctate with inconspicuous transverse ridges. Posteroventral forefemoral surface with fine but well defined punctures averaging about one diameter apart. Hindcoxal dorsum with outer margin rounded anteriorly, carinate posteriorly. Punctures of tergum I fine but well defined, averaging about 1-2 diameters apart at center of horizontal portion. Sterna finely punctate throughout, averaging about two diameters apart at center of sternum II.

Setae silvery, erect on frons, appressed on postocellar area, scutum, and tergum I; on lower gena erect, sinuous, almost twice as long as midocellar diameter in female, about one midocellar diameter in male; not concealing integument on clypeus in female, partly obscuring in male. Apical depressions of terga with silvery, setal fasciae.

Body all black, wings infumate.

♀.—Upper interocular distance equal to  $0.66 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Clypeal lamella narrow, its free margin slightly arcuate (Fig. 227). Dorsal length of flagellomere I  $3.0 \times$  apical width, of flagellomere IX  $1.5 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 13.3 mm; head width 3.6 mm.

♂.—Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella sharply pointed apically, slightly concave subapically, and parallel to each other basally (Fig. 228). Dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII broadly rounded apically (Fig. 230). Genitalia: Figs. 231, 232. Length 8.8 mm; head width 2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 233).—Southwestern part of Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: Deepdene, 29 Dec 1963, L.M. O'Halloran (WAM). PARATYPE: AUSTRALIA: Western Australia: Albany, 18 Jan 1991, R. Patterson (1 ♂, WAM).



FIGURE 233. Collecting localities of *Pison cicatricosum* Pulawski, sp. nov.

### *Pison ciliatum* Evans

Figures 234-240.

*Pison ciliatum* Evans, 1981:423, ♀. Holotype: ♀, Australia: Queensland: Amby (QMB), examined. — Cardale, 1985:258 (in catalog of Australian Sphecidae).

**RECOGNITION.**—The female of *P. ciliatum* shares with several other species the presence of a psammophore on the lower gena, mandibular posterior margin, and forefemoral venter, and the



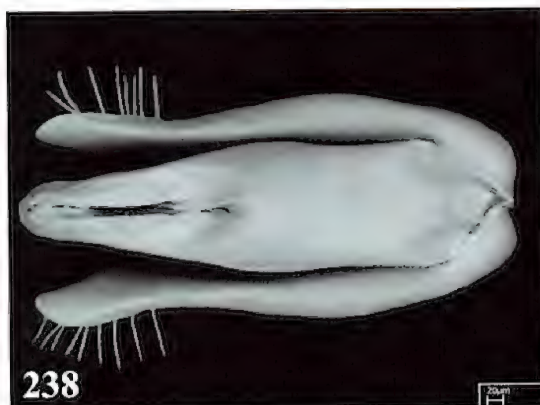
lower gena unsculptured and asetose between the oral fossa and the psammophore. It differs from *P. amabile* and *P. punctatum* in having a black gaster (rather than all or partly ferruginous), and from the remaining species with psammophores (except some *P. pusillum*) in having the tibiae all or partly ferruginous, in many specimens also the femora (rather than black). Unlike *P. pusillum*, the scutal punctures of *P. ciliatum* are separated by linear interspaces (rather than well-defined ones) and in many specimens the tergal setae are golden (rather than silvery). A subsidiary recognition feature of *P. ciliatum* is a relatively wide distance between the antennal sockets, equal to about  $2.5 \times$  socket diameters.

The male is characterized by the apically rounded or insignificantly emarginate sternum VIII, without posterolateral angles. Unlike the other species with this characteristic except *P. punctatum*, the male of *P. ciliatum* has the mid- and hindfemora and all tibiae ferruginous (in *P. punctatum* at least terga I and II are ferruginous rather than black, and in the other species the legs are all black or only the tarsi are ferruginous). It resembles *P. pseudociliatum* in the coloration and the shape of sternum VIII, but differs by the following: scutal and mesopleural punctures compressed against each other (in *P. pseudociliatum* separated by narrow gaps), upper interocular distance equal to  $0.84\text{--}0.86 \times$  lower interocular distance (rather than to  $1.00 \times$  lower interocular distance), the ocellular distance equal to  $1.7\text{--}1.8 \times$  hindocellar diameter (rather than  $2.3 \times$  hindocellar diameter), sterna uniformly punctate (rather than sterna III-VI unsculptured and shiny preapically), and body length  $5.6\text{--}5.8$  mm (rather than  $10.5$  mm). The scutal punctures compressed (separated by linear interspaces) are shared with *P. psammophilos*, from which *P. ciliatum* differs by the following: ocellular distance equal to  $1.7\text{--}1.8 \times$  hindocellar diameter (rather than  $0.9\text{--}1.2 \times$  hindocellar diameter), most punctures of sterna II and III are no more than one diameter apart, some punctures up to  $1\text{--}2$  diameters apart (in *P. psammophilos* the punctures of sternum II apicomesally and of sterna III and IV mesally are several diameters apart), and legs ferruginous (rather than all black or tibiae dark ferruginous).

**DESCRIPTION.**—Frons dull, finely punctate, punctures compressed against each other. Occipital carina joining or not joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit evanescent or absent in female, slightly longer than midocellar diameter in male. Scutum foveate or not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal and mesopleural punctures compressed against each other, mesopleural integument partly concealed by vestiture. Tegula enlarged. Postspiracular carina about  $1.0\text{--}1.3 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina inconspicuous in some specimens); dorsum closely punctate (punctures compressed against each other) and partly irregularly ridged, partly concealed by appressed setae; side closely punctate (punctures compressed against each other), interspaces in most females merging into small ridges, in males conspicuously ridged; posterior surface ridged. Posteroventral forefemoral surface finely, closely punctate. Hindcoxal dorsum with outer margin carinate or not carinate. Punctures of tergum I minute, interspaces almost linear. Sternum II punctate throughout, punctures in female about  $2\text{--}3$  diameters apart apicomesally, about one to two diameters apart on apical depression, in male about  $2\text{--}3$  diameters apart mesally.

Setae golden, appressed on thorax and tergum I; setae of lower gena: see below; apical depressions of terga with golden setal fasciae (setae silvery in specimen from Hann River, Queensland).

Head, thorax, propodeum, and gaster black, mandible ferruginous (dark brown basally and apically); in some females the following are ferruginous: clypeal lobe next to free margin, scape, pedicel, and basal flagellomeres ventrally. In most females examined, forefemur is black in basal half to two thirds, midfemur ferruginous or black dorsally in basal half, and hindfemur ferruginous,



FIGURES 234–239. *Pison ciliatum* Evans. (234) Female clypeus and mandibles; (235) Male clypeus and mandibles; (236) Female body in dorsal view; male; (237) Sternum VIII (ventral view); (238) Genitalia in dorsal view; (239) Genitalia in lateral view.



but all femora black in females from Hann River, Queensland; in male forefemur black except ferruginous apically, midfemur ferruginous except black basodorsally, hindfemur ferruginous; tibiae, and tarsi ferruginous in most specimens, but tibiae partly black in female from Hann River.

♀ (Fig. 236).—Upper interocular distance equal to  $0.62 \times$  of lower interocular distance; ocellular distance equal to  $0.8\text{--}1.0 \times$  of hindocellar diameter, interocellar distance  $1.1 \times$  hindocellar diameter; eye height equal to  $0.9 \times$  distance between eye notches. Clypeal lip about as long mesally as laterally, its free margin slightly sinuous, distance between lip corners greater than that between corner and adjacent orbit (Fig. 234). Distance between antennal sockets equal to about  $2.5 \times$  socket diameters. Dorsal length of flagellomere I  $2.2 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Gena, mandibular posterior margin, propleural and forecoxal outer margins, and foretrochanteral and forefemoral venters with psammophores (longest setae of genal psammophore about  $1.1 \times$  greatest forefemoral width, of mandibular psammophore about  $1.0 \times$  greatest forefemoral width, those of forefemoral psammophore about  $0.8 \times$  greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophore. Mandible: trimmal carina incised at about midlength. Length 6.8–7.8 mm; head width 2.2–2.5 mm.

♂.—Upper interocular distance equal to  $0.84\text{--}0.86 \times$  lower interocular distance; ocellular distance equal to  $1.7\text{--}1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.94 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 235). Dorsal length of flagellomere I  $1.7\text{--}1.8 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Setae of lower gena curved, subappressed, slightly longer than midocellar diameter. Sternum VIII rounded or insignificantly emarginate apically, without apicolateral corner (Fig. 237). Genitalia: Figs. 238, 237. Length 5.6–5.8 mm; head width 1.8–1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 240).—New South Wales, Queensland.

**RECORDS.**—**AUSTRALIA:** **New South Wales:** 6 km E Campbelltown (1 ♀, ANIC), Gilgandra (2 ♂, AMS), Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$  (1 ♀, CAS), 30 km E Gunnedah (1 ♀, QMB), Warrenburg National Park (5 ♀, UCD), Warrumbungle National Park at  $31^{\circ}16'S$   $148^{\circ}57'E$  (4 ♀, 3 ♂, MNKB), Warrumbungle National Park: Camp Pincham (3 ♀, ANIC), Yuraigir Creek Reserve 25 km SE Grafton at  $25^{\circ}53'S$   $153^{\circ}05'E$  (1 ♀, AMS). **Queensland:** Amby (4 ♀, QMB, holotype and paratypes of *P. ciliatum*), Carnarvon National Park at  $25^{\circ}03.6'S$   $148^{\circ}14.1'E$  (1 ♀, 1 ♂, CAS) and  $25^{\circ}04.0'S$   $148^{\circ}14.7'E$  (2 ♂, CAS), Hann River at  $15^{\circ}11'S$   $143^{\circ}52'E$  (1 ♀, ANIC), 5 km N Leyburn at  $27^{\circ}58'S$   $151^{\circ}38'E$  (1 ♂, QMB), Rockhampton (1 ♀, CAS).



FIGURE 240. Collecting localities of *Pison ciliatum* Evans.

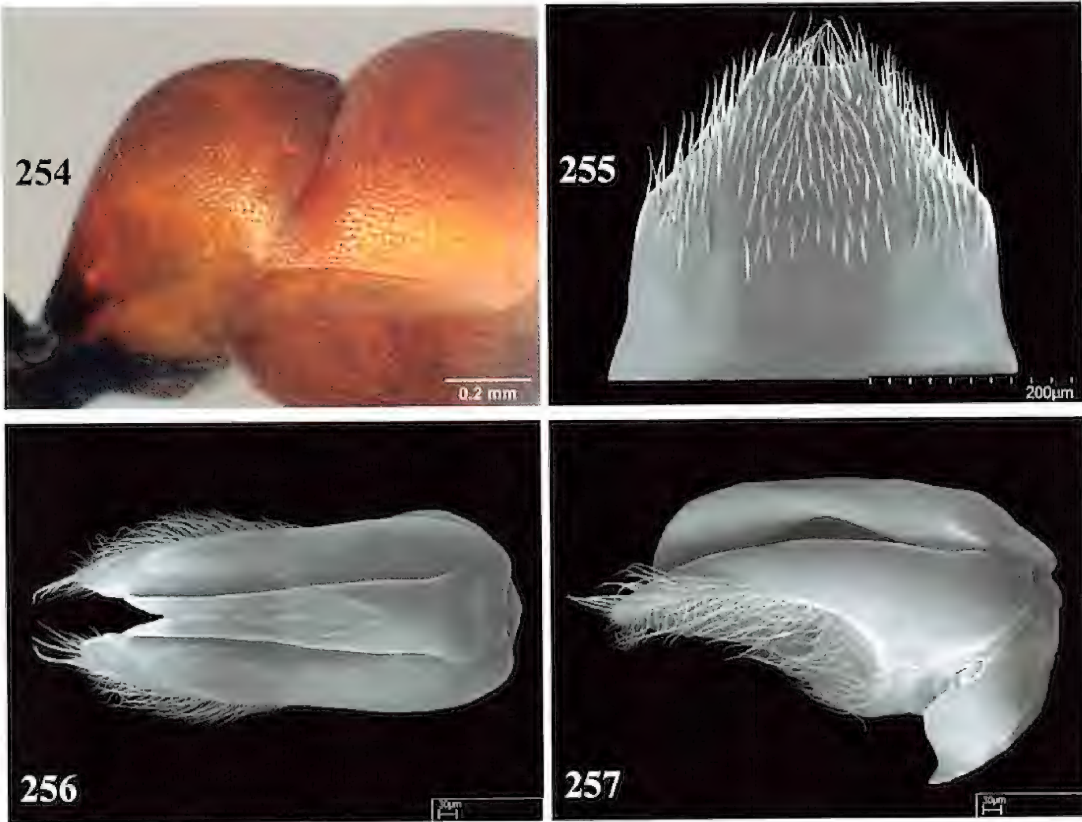
***Pison clypeare* Pulawski, species nova**

Figures 241–247.

**NAME DERIVATION.**—*Clypeare* is a Neolatin neuter adjective derived from *clypeus*; with reference to the unusual clypeus of this species.

**RECOGNITION.**—*Pison clypeare* has two submarginal cell, the second one elongate, with length of posterior margin equal to  $1.9\text{--}2.0 \times$  its height (Fig. 244), a partly impunctate tegula, the scutellum foremargin with a foveate sulcus between the axillae (sulcus inconspicuous in some speci-





FIGURES 254–257. *Pison compressum* Pulawski, sp. nov., male. (254) Base of gaster in profile with moderately defined apical depression of tergum I; (255) Sternum VIII (ventral view); (256) Genitalia in dorsal view; (257) Genitalia in lateral view.

cus relatively deep, with punctures that are relatively large near midline and gradually diminishing in size toward lateral margin, interspaces merging into irregular ridges; side punctate, most punctures not merging into ridges in female, merging in male; posterior surface punctate, with interspaces merging into irregular ridges. Forewing with two submarginal cells; length of posterior margin of second submarginal cell  $1.8\text{--}2.0 \times$  height. Posteroventral forefemoral surface impunctate or sparsely punctate in female, closely punctate in male. Hindcoxal dorsum with outer margin sharply carinate only apically. Punctures of tergum I well defined, less than one diameter apart, almost compressed against each other on apical depression. Terga I and II separated by constriction that is unusually deep in female (Fig. 252), varying from deep to relatively shallow in male (Figs. 253, 254); apical depression of tergum I positioned markedly below more anterior part of tergum in female, distinctly to rather shallowly so in male. Sternum II with large, conspicuous punctures that average mesally more than one diameter apart, narrowly impunctate apically (Fig. 251).

Setae silvery and appressed on frons, gena, and thorax, practically absent on tergum I, directed dorsally between dorsal end of midfrontal carina and midocellus, partly concealing integument on clypeus in female, entirely so in male. Apical depressions of terga without setal fasciae.

Head, thorax, and propodeum black, female clypeus ferruginous next to lamella (also along free margin of lateral section in some specimens); mandible yellowish brown basally, ferruginous subapically, dark apically; antenna ferruginous (apical flagellomere darkened). Legs all ferruginous, gaster ferruginous.

♀.—Upper interocular distance equal to  $1.04 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $1.12\text{--}1.14 \times$  distance between eye notches. Free margin of clypeal lamella in many specimens with obtuse, median point (Fig. 248). Dorsal length of flagellomere I  $1.1 \times$  apical width (shorter than pedicel), of flagellomere IX  $0.8 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 5.9–6.9 mm; head width 1.6–1.7 mm.

♂.—Upper interocular distance equal to  $1.00\text{--}1.05 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.5 \times$  hindocellar diameter; eye height equal to  $1.16\text{--}1.18 \times$  distance between eye notches. Free margin of clypeal lamella arcuate, with obtuse, median point (Fig. 249). Dorsal length of flagellomere I  $1.0\text{--}1.1 \times$  apical width (shorter than pedicel), of flagellomere X  $0.7 \times$  apical width. Sternum VIII shallowly, broadly emarginate (Fig. 255). Genitalia: Figs. 256, 257. Length 4.4–5.5 mm; head width 1.3–1.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 258).—New South Wales, Queensland, South Australia, Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: **Western Australia:** Kalamunda, 9–28 Feb 1914, R.E. Turner (BMNH).

**PARATYPES:** AUSTRALIA: **New South Wales:** 3 km NE Bilpin, 26 Dec 1986, N.W. Rodd (1 ♂, AMS); 5 km E Bilpin, 7 Dec 1981, N.W. Rodd (1 ♂, AMS); 7 km N Bilpin, 25 Nov 1977, N.W. Rodd (1 ♂, AMS); 7 km NE Bilpin, 30 Nov 1985, N.W. Rodd (1 ♂, AMS), Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , 28 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Homestead Gorge in Mootwintji National Park at  $31^{\circ}17'S$   $142^{\circ}18'E$ , 7–13 Oct 1988, E.D. Edwards (1 ♀, ANIC); Lake George Cullerin, 15 Feb 1988, M.E. Irwin (1 ♀, UCD); Lane Cove, 11 Nov 1945, no collector (1 ♀, AMS); Mount Hope, 9 Oct 1980, J.C. Le Souet (1 ♀, AMS); Sydney: Cheltenham, 6 Nov 1949 and 26 Nov 1950, no collector (2 ♀, AMS); Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$ , V. Ahrens and W.J. Pulawski, 16 Dec 2009 (3 ♂, CAS), 22 Dec 2009 (1 ♂, CAS), 24 Dec 2009 (1 ♂, CAS); Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$ , V. Ahrens and W.J. Pulawski, 7 Jan 2012 (4 ♀, CAS) and 8 Jan 2012 (1 ♀, CAS). **Queensland:** 25 km E Bollon, 17 Dec 1976, E.M. Exley and T. Low (1 ♂, QMB); Brisbane, 19 Nov 1913, H. Hacker (1 ♂, BMNH), 28 Sept 1968, E.M. Exley (1 ♂, QMB), and 7 Nov 1979, H.E. and M.A. Evans (1 ♀, QMB); Brisbane: Calmvale: Johnstons Road, 5 Oct 1975, R.I. Storey (2 ♂, QMB); 24 km NE Eidsvold at  $25^{\circ}09'S$   $151^{\circ}11'E$ , 11 Oct 1984, I.D. Naumann and J.C. Cardale (1 ♀, ANIC); 15 km E Forsyth, 22 Nov 1976, R.I. Storey (2 ♀, ANIC); 22–24 km N Irvinebank, 29 Aug 1976, R.I. Storey (1 ♀, ♂, ANIC); 28 km NW Mount Carbine, 15 Aug 1976, R.I. Storey (1 ♀, ANIC), Split Rock at  $15^{\circ}39'S$   $144^{\circ}31'E$ , 26 June – 16 July 1993, K. Halpapp and S. De Faveri (1 ♂, ANIC). **South Australia:** Wilpena Pound Gap at  $31^{\circ}33'S$   $138^{\circ}36'E$ , 5–6 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♀, ANIC). **Western Australia:** Bunbury, 10–22 Dec 1958, A. Snell (1 ♀, AMS); Cannington, a southern suburb of Perth, 6 Feb 1953, R.P. McMillan (1 ♀, WAM); Fraser Peak, 4 Jan 1948, no collector (1 ♀, AMS); Kalamunda, R.E. Turner, 9–28 Feb 1914 (1 ♀, BMNH) and 1–11 Mar 1914 (1 ♂, BMNH); Kojonup, 3 Jan 1979, R.P. McMillan (1 ♀, WAM); Northam, 10 Nov 1979, R.M. Bohart (1 ♀, UCD); Yallingup, 23 Dec 1979, R.M. Bohart (1 ♀, CAS; 1 ♀, UCD); 6 mi E Yallingup, 22 Dec 1966, E.M. Exley (1 ♂, QMB). **No specific locality or date:** R.C.L. Perkins (1 ♂, BMNH).



FIGURE 258. Collecting localities of *Pison compressum* Pulawski, sp. nov.

*Pison congener* Turner

Figures 259-264.

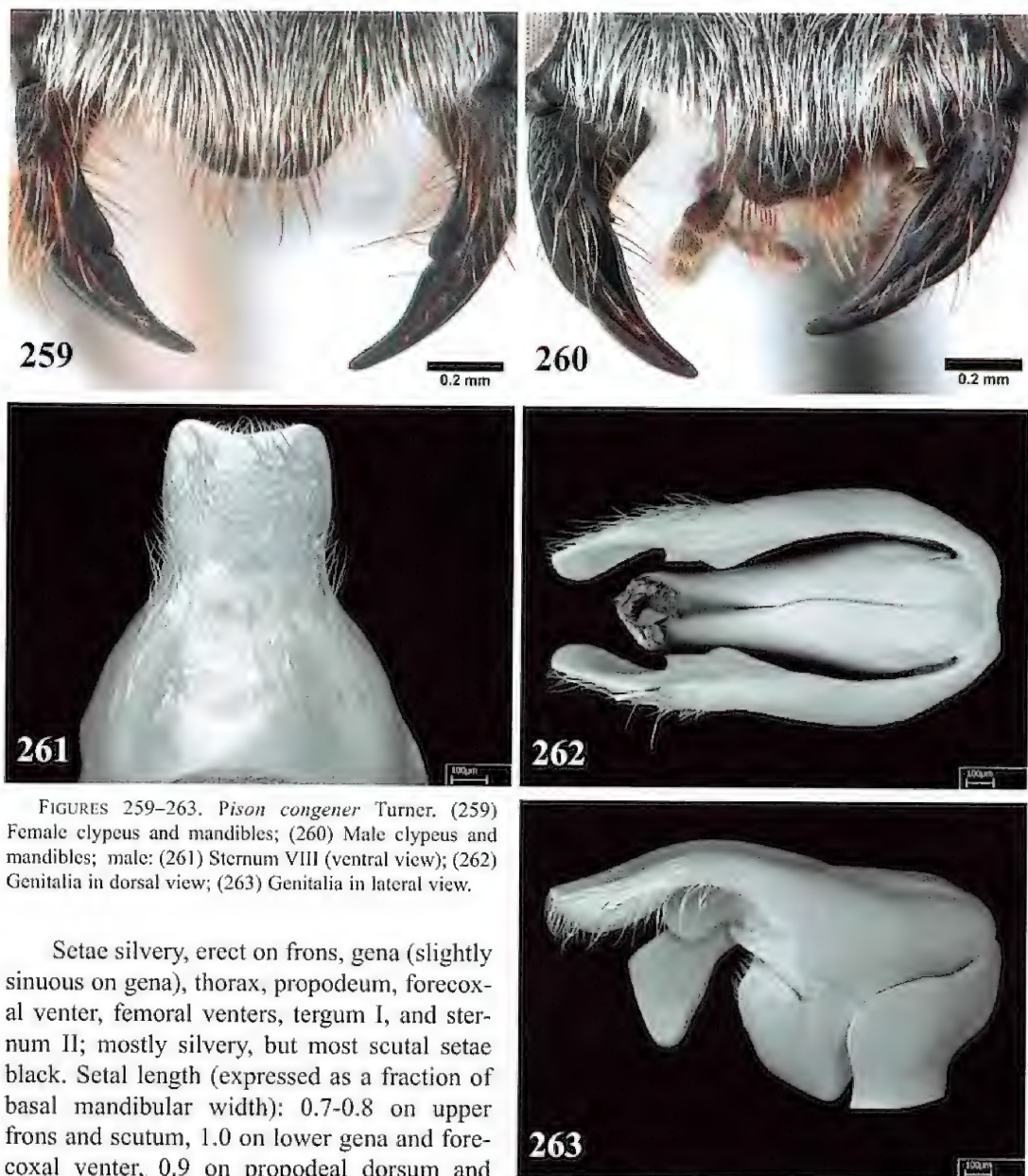
*Pison congener* Turner, 1916b:607, ♀, ♂. Lectotype: ♀, Western Australia: Yallingup (BMNH), **present designation**, examined. – Turner, 1916b:598 (in key to Australian *Pison*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:258 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— In his original description of *Pison congener*, Turner did not mention the number of specimens examined, but two females are present in The Natural History Museum, London. I have designated one as the lectotype of *congener* and the other one as the paralectotype.

**RECOGNITION.**— *Pison congener*, an all black species with erect setae on tergum I, can be recognized by the presence of a concave, glabrous, crescent-like area on the outer side of the antennal socket and the ridged outer side of the socket. In addition, the setal fasciae of terga are silvery. It shares with *P. fenestratum* and *P. festivum* a deep apical depression of tergum I, markedly below the adjacent, more anterior part of the tergum, and also a median tumescence at the base of the horizontal portion (tumescence ill-defined in some specimens). Unlike *P. fenestratum* (in addition to the crescent-like area adjacent to the antennal socket and ridged antennal socket), the scutum of *P. congener* is distinctly microsculptured and dull between punctures, sterna II-IV are punctate throughout, and the male flagellum is cylindrical, while in *P. fenestratum*, the scutum is unsculptured and shiny between punctures, the frons is flat, completely setose on the outer side of the antennal socket, sterna II-IV have only a few, sparse punctures on most of the surface, and male flagellomeres I and II are concave basoventrally and convex apicoventrally. Unlike *P. festivum* (in addition to the crescent-like area adjacent to the antennal socket and ridged antennal socket), the setal length is about  $1.0 \times$  basal mandibular width on the middle frons ventrally (rather than  $1.5 \times$ ), and the apical depressions of terga II-IV have appressed, silvery setae (rather than bright golden setae). *Pison cicatricosum* has an identical glabrous impression adjacent to the antennal socket, but differs in having the setae appressed on tergum I and the ocellocular distance equal to  $0.8 \times$  hindocellar diameter in the female and  $1.1 \times$  in the male (rather than  $1.2-1.3 \times$  and  $1.6-2.1 \times$ , respectively, in *P. congener*).

**DESCRIPTION.**— Upper frons dull, microsculptured, with ill-defined punctures more than one diameter apart; concave, glabrous crescent-like area on lateral side of antennal socket; lateral side of socket ridged. Distance between midocellus and hindocellus equal to  $1.3 \times$  distance between hindocelli. Distance between antennal sockets equal to distance between socket and adjacent orbit. Labrum truncate anteriorly. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate or finely foveate along flange, with rudimentary, short, longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging about one diameter apart anteriorly, about two diameters apart posteriorly; interspaces conspicuously microareolate, dull. Mesopleural punctures well defined, averaging about one diameter apart, interspaces conspicuously microareolate, dull. Postspiracular carina rudimentary. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with or without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum conspicuously, obliquely ridged, punctate between ridges; side with well defined punctures; posterior surface ridged. Posteroventral forefemoral surface with large punctures that are several diameters apart. Hindcoxa dorsum with outer margin not carinate. Punctures of tergum I well defined, base of horizontal part with median tumescence; apical depression markedly below adjacent, more anterior part of tergum. Sternum II punctate throughout, punctures well defined, several diameters apart mesally; interspaces unsculptured, shiny.





FIGURES 259–263. *Pison congener* Turner. (259) Female clypeus and mandibles; (260) Male clypeus and mandibles; male: (261) Sternum VIII (ventral view); (262) Genitalia in dorsal view; (263) Genitalia in lateral view.

Setae silvery, erect on frons, gena (slightly sinuous on gena), thorax, propodeum, forecoxal venter, femoral venters, tergum I, and sternum II; mostly silvery, but most scutal setae black. Setal length (expressed as a fraction of basal mandibular width): 0.7–0.8 on upper frons and scutum, 1.0 on lower gena and forecoxal venter, 0.9 on propodeal dorsum and hindfemoral venter basally, 0.7 on forefemoral venter, up to 0.7 on tergum I and up to 0.9 on sternum I basally.

Body all black.

♀.— Upper interocular distance equal to  $0.76\text{--}0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7\text{--}1.0 \times$  hindocellar diameter; eye height equal to  $0.88\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 259). Dorsal length of flagellomere I  $2.6\text{--}3.1 \times$  apical width, of flagellomere X  $1.5 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 10.0–10.8 mm; head width 3.1 mm.

♂.—Upper interocular distance equal to  $0.88 \times$  lower interocular distance; ocellocular distance equal to  $1.6\text{--}2.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Clypeal lamella acutely angulate, relatively wide basally (Fig. 260). Dorsal length of flagellomere I  $3.0 \times$  apical width, of flagellomere X  $1.7 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 261). Genitalia: Figs. 262, 263. Length 10.7–12.1 mm; head width 3.4–3.5 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 264).—New South Wales, Northern Territory, Tasmania, Western Australia.

**RECORDS.**—AUSTRALIA: **New South Wales:** Nadgee Nature Reserve 10 km S Newton Beach (1 ♀, ANIC). **Northern Territory:** Elizabeth River 40 km SE Darwin (1 ♀, QMB). **Tasmania:** Pittwater (1 ♂, ANIC). **Western Australia:** Fitzgerald River National Park ca 15 km W Hopetoun at  $33^{\circ}56.8'S$   $119^{\circ}58.8'E$  (1 ♂, CAS), Kelmscott (1 ♂, SAM), King George Sound (1 ♀, AMS), Porongorup National Park: Mira Flores Hut (3 ♂, CAS), Yallingup (2 ♀, BMNH, lectotype and paralectotype of *Pison congener*).



FIGURE 264. Collecting localities of *Pison congener* Turner.

***Pison contiguum* Pulawski, species nova**

Figures 265–267.

**NAME DERIVATION.**—*Contiguus* (neuter: *contiguum*) is a Latin adjective meaning *contiguous*, sharing a common border, touching; with reference to the contiguous scutal punctures of this species.

**RECOGNITION.**—*Pison contiguum* is a small species: the length of the female is 6.4 mm. It has the head, thorax, propodeum and gaster all black, three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. In addition, the scutal punctures are well defined and contiguous.

The female (the male is unknown) is characterized by the presence of psammophores on the lower gena and forefemoral venter, the lower gena unsculptured and shiny between the oral fossa and the psammophore, and the tegula largely punctate throughout except posterolaterally (Fig.



FIGURES 265–266. *Pison contiguum* Pulawski, sp. nov., female. (265) Clypeus and mandibles; (266) Tegula and adjacent scutum.



266). This character combination is shared with three other species. Unlike *P. dentatum* (in which the mandible is black basally and has two conspicuous, preapical teeth on the inner margin), the mandible of *P. contiguum* is yellowish basally and has no preapical teeth on the inner margin. The females of *P. notochthonum* and *P. stenometopon* can be recognized by the character discussed under these species.

**DESCRIPTION.**—Frons dull, finely punctate, punctures compressed against each other, middle supraantennal carina invisible under appressed pilosity. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $1.5 \times$  as long as midocellar diameter. Propleuron sparsely punctate. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, contiguous (Fig. 266), interspaces linear. Tegula enlarged, punctate (except posterolaterally). Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular rudimentary carina carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum longitudinally or obliquely ridged in anterior half, closely punctate between ridges and on remaining surface; side and posterior surface markedly ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Horizontal part of tergum I, anterior of apical depression, with most punctures less than one diameter apart (some punctures about one diameter apart). Sternum II impunctate apicomeresally in female, punctate throughout in male (punctures averaging 2-3 diameters apart mesally).

Setae silvery, subappressed on upper frons, appressed on postocellar area, scutum, and tergum I, radiating from midpoint on upper frons (for genal setae of female: see below); completely concealing integument on clypeus (including part of lamella). Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black; mandible yellowish basally. Femora and foretibiae black, mid- and hindtibiae and tarsi all black or partly ferruginous in female, dark ferruginous in male.

♀.—Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella slightly arcuate, with obtuse lateral corner; distance between corners about equal to that between corner and eye margin (Fig. 265). Dorsal length of flagellomere I  $1.7 \times$  apical width, of flagellomere IX  $1.0 \times$  apical width. Lower gena, mandibular posterior margin, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.5 \times$ ,  $0.8 \times$ , and  $0.8 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with minute incision at about midlength. Length 6.4 mm; head width 2.0 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 267).—Northern part of Northern Territory, northern Queensland.



FIGURE 267. Collecting localities of *Pison contiguum* Pulawski, sp. nov.



**RECORDS.**— HOLOTYPE: ♀, **Queensland:** Hann River at 15°11'S 143°52'E, 17 Aug – 15 Sept 2003, P. Zborowski and S. Shattuck (ANIC ).

PARATYPE: **AUSTRALIA: Northern Territory:** Anbangbang Billabong in Kakadu National Park at 12°52'S 132°48'E, 10 June 1996, G.R. Brown (1 ♀, NTM).

***Pison curiosum* Pulawski, species nova**

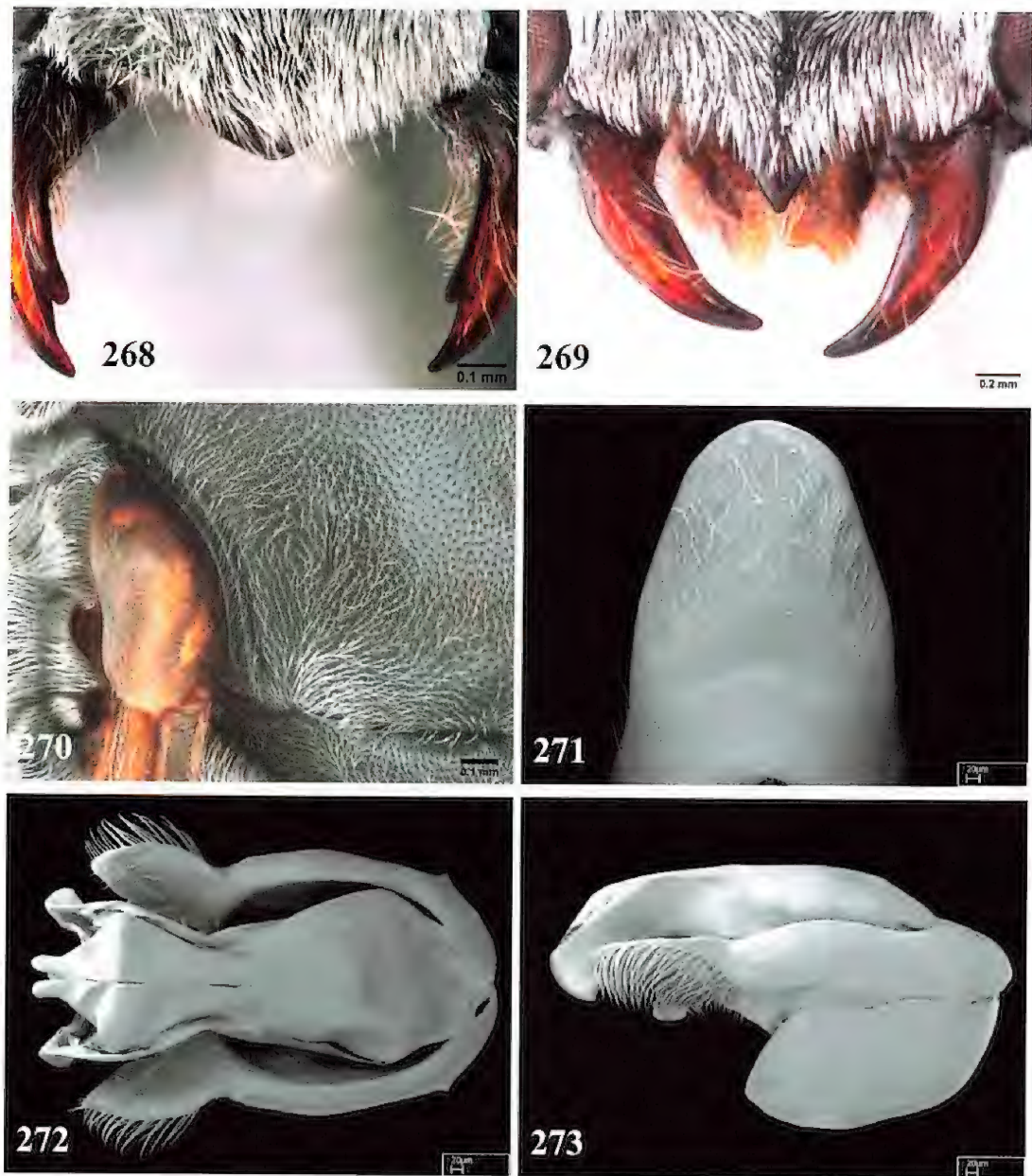
Figures 268-274.

**NAME DERIVATION.**— *Curiosum* is a Latin neuter adjective meaning *curious*.

**RECOGNITION.**— The female of *P. curiosum* resembles *tegulare* in having an unusually long, narrowing posterad tegula that extends beyond the anterior margin of the axilla (Fig. 270). The tegula also extends beyond the anterior margin of the axilla in *P. translucens*, but in *P. curiosum* the whole body is black, whereas at least the mid- and hindtibiae are ferruginous in *P. translucens*. Unlike *P. tegulare*, the tegula of *P. curiosum* is largely impunctate and asetose (but finely microsculptured), with the inner margin convex posteriorly, the mandible is black except brown apically, the legs and gaster are black, the clypeal lamella is obtusely angulate (Fig. 268), the lower gena and the forefemur have no psammophores (genal setae shorter than midocellar diameter), the lower gena is punctate and setose on each side of the oral fossa, and the body length is 7.6-8.0 mm in female. In *P. tegulare* the tegula is nearly completely punctate and setose (only a narrow, marginal rim is impunctate and asetose), with inner margin concave posteriorly, the mandible is yellowish brown (except basally and apically), the tibiae are all or partly ferruginous, at least terga I and II are ferruginous, and in the female: the clypeal lamella is arcuate, the lower gena and the forefemur have a psammophore, and the lower gena is impunctate and asetose between the oral fossa and the psammophore; the body length is 5.1-5.3 mm in the female and 4.5-4.6 mm in the male. Subsidiary recognition features of *P. curiosum* are: the presence of a small, preapical tooth on the trimmal carina of the mandible, and the presence of a longitudinal carina between the propodeal dorsum and side (the carina does not extend until the propodeal spiracle).

The male has sternum VIII rounded apically, without a posterolateral corner (Fig. 271). It differs from the other species with this feature in having the tegula extending to the anterior margin of the axilla, with the outer margin minimally concave, almost rectilinear (Fig. 270). The following are the subsidiary recognition features: gaster and legs black; free margin of clypeal lamella acutely angulate, not concave on each side of midpoint, lateral corner absent or barely indicated; scutal punctures not compressed against each other; tergum VII and sternum VII without erect setae; and sternum VIII without median swelling. Unlike *P. setiferum* (in addition to the tegular character), the ocellocular distance of *P. curiosum* is equal to  $1.7 \times$  hindocellar diameter (rather than  $1.0-1.2 \times$ ), and the hindtibial spurs are black (rather than whitish).

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart; interspaces markedly microareolate. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit round or transversely elongate, about as long as  $0.5-1.0 \times$  midocellar diameter. Propleuron impunctate anteriorly. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging at least about one diameter apart (Fig. 270). Tegula conspicuously elongate, with outer margin slightly concave (Fig. 270), extending beyond anterior margin of axilla in female, reaching anterior margin of axilla in male; most of its surface impunctate and asetose, but finely microsculptured. Mesopleural punctures compressed against each other. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum, but not extending to spiracle; dorsum obliquely ridged, punctate between ridges; side finely punctate (most punctures less than one diameter apart), interspaces merging into minute ridges;



FIGURES 268–273. *Pison curiosum* Pulawski, sp. nov. (268) Female clypeus and mandibles; (269) Male clypeus and mandibles; (270) Female tegula and adjacent scutum; male: (271) Sternum VIII (ventral surface); (272) Genitalia in dorsal view; (273) Genitalia in lateral view.

posterior surface transversely ridged (ridges fine to conspicuous), punctate between ridges. Posteroventral forefemoral surface finely, closely punctate. Punctures of tergum I, on horizontal part and before apical depression, averaging about one diameter apart. Sternum II finely punctate throughout, punctures about 2-3 diameters apart mesally in females from Northern Territory and Western Australia, but about one diameter apart in those from New South Wales, 2-3 to 3-4 diameters apart in male.

Setae silvery, appressed on frons, thorax, and tergum I, diverging laterally above dorsal end of middle carina; setae of lower gena curved, subappressed in female, erect in male, about  $0.7 \times$  midocellar diameter in female, about  $1.0 \times$  in male; nearly completely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible brown apically.

♀.— Upper interocular distance equal to  $0.72\text{--}0.74 \times$  lower interocular distance; ocellocular distance equal to  $0.9\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 268). Dorsal length of flagellomere I  $2.2\text{--}2.4 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with preapical tooth (Fig. 268). Length 7.6–8.0 mm; head width 2.4 mm.

♂.— Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 269). Dorsal length of flagellomere I  $1.9 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Apical margin of sternum VIII rounded, not emarginate (Fig. 271). Genitalia: Figs. 272, 273. Length 6.0 mm; head width 2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 274).— New South Wales, Northern Territory, South Australia, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: Western Australia:** Mount Augustus National Park at  $24^{\circ}18.0'S$   $116^{\circ}47.6'E$ , 25 Apr – 7 May 2003, M.E. Irwin and F.D. Parker (ANIC).

**PARATYPES:** **AUSTRALIA: New South Wales:** Paroo Darling National Park at  $30^{\circ}51.9'S$   $143^{\circ}05.5'E$ , 14 Dec 2011, V. Ahrens and W.J. Pulawski (3 ♀, CAS). **Northern Territory:** West MacDonnell National Park ca 3 km W road to Simpson Gap at  $23^{\circ}41.8'S$   $133^{\circ}41.7'E$ , Ch.M. Palmer, 27 Oct – 27 Nov 2006 (1 ♀, NTM), 27 Nov – 27 Dec 2006 (1 ♀, CAS), 27 Dec 2006 – 27 Jan 2007 (1 ♂, CAS), 27 Jan – 27 Feb 2008 (1 ♀, NTM). **South Australia:** Mount Davies in Tompkinson Ranges, 18–21 Oct 1972, H.E. Evans (1 ♂, ANIC); 19 km N Renmark at  $34^{\circ}00'140^{\circ}47'E$ , 8 Nov – 14 Dec 1995, K.R. Pullen (1 ♀, 1 ♂, ANIC). **Western Australia:** same data as holotype (1 ♀, CAS); Hamersley Station at  $22^{\circ}18'06"S$   $117^{\circ}41'35"E$ , 28 Oct – 2 Nov 2005, CVA [= Conservation Volunteers Australia] (2 ♀, 1 ♂, AMS); Pardoo Road House at  $20^{\circ}28.3'S$   $120^{\circ}10.0'E$ , 5 Jan – 14 May 2003, F.D. Parker and M.E. Irwin (1 ♀, ANIC; 1 ♀, CAS); Serpentine Falls in Darling Ranges, 20 Jan 1971, G.A. Holloway (1 ♀, AMS); Tom Price at  $22^{\circ}18.8'S$   $117^{\circ}40.5'E$ , 20 Apr – 4 May 2003, F.D. Parker and M.E. Irwin (4 ♀, CAS).



FIGURE 274. Collecting localities of *Pison curiosum* Pulawski, sp. nov.



*Pison decipiens* F. Smith

Figures 275-282.

*Pison decipiens* F. Smith, 1869:295, ♂. Lectotype: ♂, Australia: Western Australia: Champion Bay, now Geraldton (BMNH), **present designation**, examined. — Kohl, 1885:186 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera), 1894:33 (nest structure, nest parasite: *Chrysis transversa* Smith); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*), 612 (comparison with *Pison dimidiatum*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:258 (in catalog of Australian Sphecidae).

*Pison dimidiatum* F. Smith, 1869:295, ♂ (as *dimidiatus*, incorrect original termination). Lectotype: ♂, Australia: Western Australia: Champion Bay, now Geraldton (BMNH), **present designation**, examined. **New synonym.** — Kohl, 1885:186 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Turner, 1916b:597 (in key to Australian *Pison*), 603 (recognition characters); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:258 (in catalog of Australian Sphecidae).

*Pison inconspicuum* Turner, 1916b:612, ♂. Lectotype: ♂, Western Australia: Mundaring Weir (BMNH), **present designation**, examined. **New synonym.** — Turner, 1916b:598 (in key to Australian *Pison*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:260 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Smith did not indicate the number of specimens examined in his descriptions of *Pison decipiens* and *dimidiatum*. I have designated as lectotypes of these species the only specimen of each present in the National History Museum, London. Although said in the description to originate from Champion Bay, the specimens are labeled "Australia: Swan R.", presumably Swan River.

In the original description of *Pison inconspicuum* Turner did not indicate the number of specimens studied. I have designated as the lectotype of this species the only specimen, a male, present at The National History Museum, London.

**RECOGNITION.**— *Pison decipiens* has three submarginal cells, the second recurrent vein interstitial with second intersubmarginal vein or nearly so, and setae appressed on tergum I.

In the female, the inner mandibular margin has a rounded tooth at about two thirds of length, a character shared with *P. impressiventre*, *P. protrudens*, and *P. scutatum*. This feature is invisible in most museum specimens, having the mandibles closed. Such specimens can be recognized by the following combination: lower gena punctate and setose on each side of the oral fossa, its setae sinuous and longer than midocellar diameter (contrastingly straight and shorter than midocellar diameter in *P. protrudens*), psammophore absent, clypeal surface slightly convex dorsally of the lamella, which is roundly triangular, ocellocular distance equal to  $1.0-1.4 \times$  midocellar diameter, dorsal length of flagellomere I about  $2.1 \times$  apical width, sterna punctate throughout, the scutal punctures averaging one diameter apart or less, but some midscutal punctures, just behind the center, about two diameters apart, and at least the hindtibia is ferruginous (tibiae contrastingly all black in *P. scutatum*). *Pison basale* is similar, but in *P. decipiens* the antenna is black or the basal three flagellomeres are ferruginous on the inner side, the tegular apex is rounded, and the occipital carina is not expanded, equal to about  $0.2 \times$  the midocellar diameter. In *P. basale*, the scape, pedicel, and basal two flagellomeres are ferruginous, the tegular apex is obtusely pointed, and the occipital carina is slightly expanded ventrally, equal to about  $0.5 \times$  midocellar diameter. The differences between the females of *P. decipiens* and *P. impressiventre* are weak, and these species can best be recognized by association with topotypical males. The most reliable difference is the color of the tergal setae, which are silvery in *P. decipiens* and golden or with golden tinge in *P. impressiventre*. Somewhat helpful is the color of the gaster that is all black in *P. impressiventre*

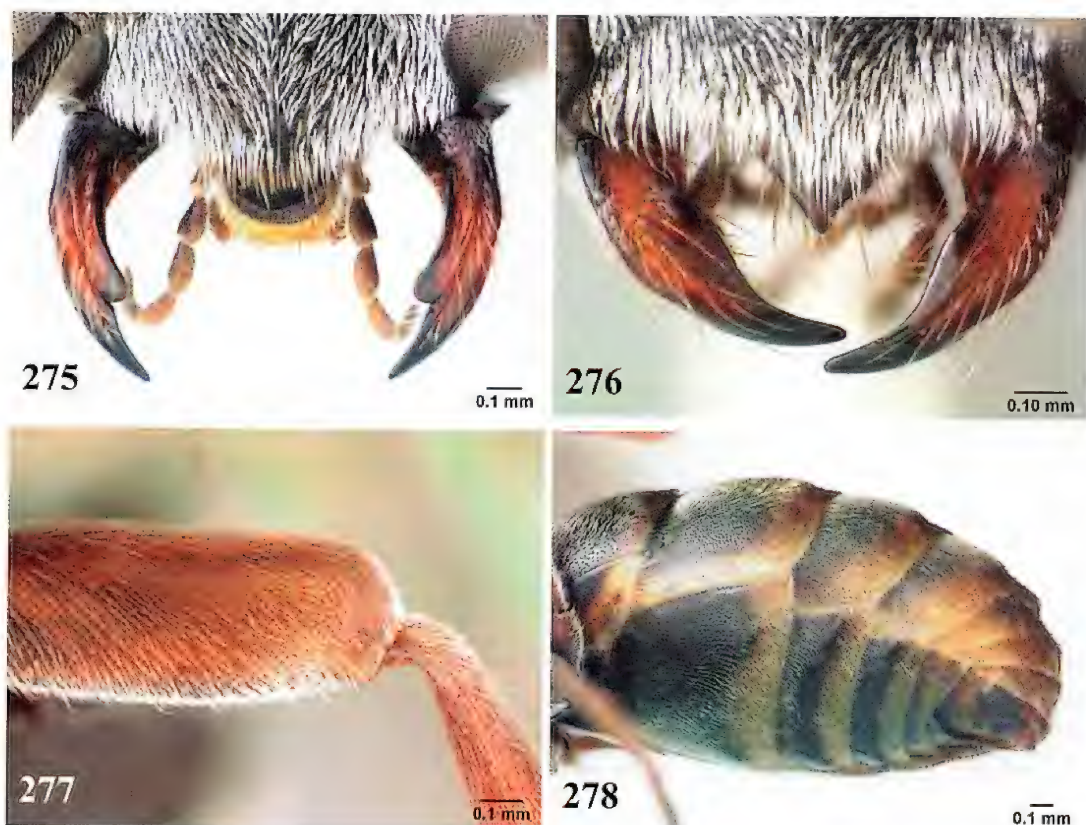
(except for the apical depressions), but all or partly ferruginous basally in several *P. decipiens*. Also, *P. impressiventre* is known from the Northern Territory and Western Australia, whereas *P. decipiens* occurs, in addition to these two states, also in New South Wales, South Australia, and Queensland.

The males of *P. decipiens* share with *P. ocellare* and *P. scutatum* the following combination: dorsal length of flagellomere I  $1.8\text{--}2.3 \times$  apical width ( $2.7\text{--}3.0 \times$  in *P. novaecambriae*); flagellum without tyloids (flagellomeres III-VIII with tyloids in *P. angulare*); clypeal lamella acutely angulate (obtusely angulate or rounded in *P. tridentatum*); mandible simple apically (bidentate in *P. tridentatum*), all black or ferruginous mesally (pale yellow in at least basal third in most *P. xanthognathos*); ocellocular distance  $1.5\text{--}2.4 \times$  hindocellar diameter ( $0.9 \times$  in *P. formicarium*); propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; propodeal dorsum ridged; sterna without apicomedian impressions (round apicomedian impressions present on sterna IV-VI in *P. impressiventre*); sternum VIII without glabrous line extending to apical margin (glabrous line present in *P. angulare*), with apical margin shallowly, broadly emarginate (Fig. 279). Unlike *P. ocellare*, the hindfemur is at least slightly thickened dorsoapically in *P. decipiens*, markedly so in most specimens (Fig. 277). Unlike *P. protrudens*, the setae of the propodeal dorsum extend beyond the lateral carina. A subsidiary recognition feature is the presence, in most specimens, of a basal swelling on sternum VIII (swelling mostly unsculptured, but punctate or aciculate in some specimens). *Pison decipiens* differs from *P. scutatum* in having the tibiae all or partly ferruginous (rather than all black), and the subsidiary recognition features are: scutal punctures varying from less than one diameter apart to more than one diameter apart (more than one diameter apart in *P. scutatum*) and gastral base varying from all black to all or partly ferruginous (gaster all black in *P. scutatum*).

**JUSTIFICATION OF NEW SYNONYMY.**—The only difference between the lectotypes of *Pison decipiens* and *P. dimidiatum* is in color: in the latter, the gaster is nearly all ferruginous (brown apically), whereas in the former the ferruginous is limited to a narrow band adjacent to the apical depression of tergum I. This difference, however, falls within the limits of the individual variation of this species. I therefore synonymize the two names. They were proposed in the same paper on the same page and, acting as First Reviser (Article 24.2), I hereby select *Pison decipiens* as the valid name and *Pison dimidiatum* as its junior synonym.

Turner (1916b) differentiated *Pison inconspicuum* from *decipiens* by the leg color: in the former species the trochanters and the femora were supposed to be wholly ferruginous, whereas in the latter the trochanters were all black and the femora ferruginous at the apex only. According to my observations, there is a continuous color spectrum of these body parts and, as I could not detect any other difference between these two nominal species, I treat them as synonyms.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures small but well defined to medium sized, in female averaging less than one diameter apart, but some midscutal punctures, just behind the center, up to about two diameters apart, in male less than one diameter apart to more than one diameter apart (this variation can be observed in specimens collected the same day in the same place, e.g., in Bowling Green Bay National Park, Queensland); interspaces in most specimens unsculptured, shiny. Tegula with outer margin regularly convex in most specimens, but outer margin minimally concave mesally in single female from Cobra Station area, West Australia. Mesopleural punctures compressed against each other, interspaces in many specimens merging into small ridges. Postspiracular carina rudimentary, about  $0.6 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral



FIGURES 275–278. *Pison decipiens* F. Smith. (275) Female clypeus and mandibles; (276) Male clypeus and mandibles; (277) Distal part of male hindfemur; (278) Male sterna in lateral oblique view.

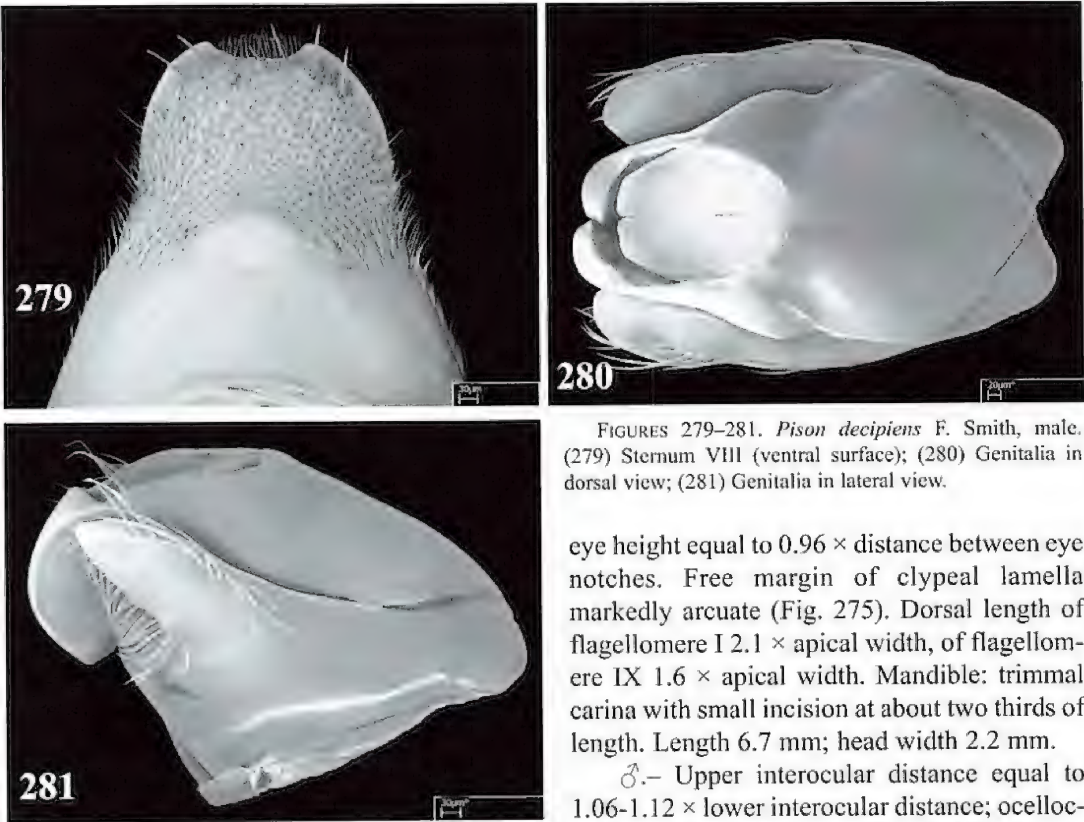
metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum and side punctate, interspaces merging into fine ridges; posterior surface ridged. Punctures of tergum I well defined, averaging about one diameter apart, nearly compressed on apical depression. Punctures of sternum II well defined, about two diameters apart mesally in female, more than one diameter apart mesally in male.

Setae silvery (with golden tinge on upper frons in many specimens), suberect or erect on upper frons and scutum; suberect and curved on each side of oral fossa in most specimens, but straight and nearly appressed, oriented ventrad, in some males; concealing integument on clypeus; appressed on tergum I; setal length slightly more than midocellar diameter on upper frons and lower gena,  $0.5\text{--}0.6 \times$  midocellar diameter on scutum.

Head, thorax, and propodeum black, mandible ferruginous mesally, antenna black (in some specimens flagellomeres I–III partly or all red). Femora all ferruginous or fore- and mid femora black, as are most of hindfemur; tibiae, and tarsi ferruginous (all in most specimens, partly in some). Gaster either all black or terga I and II all or partly ferruginous, also part of tergum III ferruginous in many specimens (only narrow band adjacent to apical depression of tergum I may be ferruginous); all gaster ferruginous in some males.

♀.—Upper interocular distance equal to  $0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.0\text{--}1.4 \times$  hindocellar diameter, distance between hindocelli  $1.1\text{--}1.4 \times$  hindocellar diameter;





FIGURES 279–281. *Pison decipiens* F. Smith, male. (279) Sternum VIII (ventral surface); (280) Genitalia in dorsal view; (281) Genitalia in lateral view.

eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella markedly arcuate (Fig. 275). Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere IX  $1.6 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Length 6.7 mm; head width 2.2 mm.

♂.— Upper interocular distance equal to  $1.06\text{--}1.12 \times$  lower interocular distance; ocellocular distance equal to  $1.5\text{--}2.3 \times$  hindocellar diameter, distance between hindocelli  $1.3\text{--}1.7 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.94 \times$  distance between eye notches. Free margin of clypeal lip sharply angulate (Fig. 276). Dorsal length of flagellomere I  $1.7\text{--}2.1 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Hindfemur at least slightly thickened dorsoapically, conspicuously so in many specimens (Fig. 277). Sterna IV–VI in many specimens with unsculptured and asetose area before apical depression (Fig. 278), unsculptured area evanescent in some specimens, and absent in others (then sterna are punctate throughout). Sternum VIII with apical margin shallowly, broadly emarginate but convex mesally in some specimens, in many specimens swollen basomedially (Fig. 279), swelling mostly unsculptured, but punctate or aciculate in some specimens. Genitalia: Figs. 280, 281). Length 5.5–6.9 mm; head width 1.7–2.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 282).— New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **AUSTRALIA:** **New South Wales:** 56 mi. W Cobar (2 ♀, BMNH), 119 km W Cobar at  $31^{\circ}33.5'S$   $144^{\circ}37.6'E$  (1 ♂, CAS), 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (1 ♂, CAS), Gilgandra (1 ♀, AMS), Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$  (2 ♂, CAS), Menindee (1 ♂, AMS), 10 mi. N Mount Hope (1 ♀, BMNH), Narrandera (2 ♂, AMS), 15 km W Narrandera (1 ♂, AMS), Paroo Darling National Park at  $30^{\circ}51.9'S$   $143^{\circ}05.5'E$  (1 ♀, CAS), 87 km E Wilcannia at  $31^{\circ}42.8'S$   $144^{\circ}08.6'E$  (1 ♀, CAS). **Northern Territory:** Buchanan Highway 31 km SSE Victoria Highway at  $15^{\circ}57'37''S$   $130^{\circ}38'20''E$  (2 ♂, CAS), Cattle Creek 54 km SW Borroolola at  $16^{\circ}32'S$   $136^{\circ}10'E$  (2 ♂, ANIC), Cullen River bank 27 km Pine Creek at  $14^{\circ}02.0'S$   $131^{\circ}56.6'E$  (2 ♂, CAS), Gregory National Park at  $15^{\circ}36'43''S$   $130^{\circ}24'08''E$  (2 ♂, CAS), at  $16^{\circ}03.7'S$   $130^{\circ}27.1'E$  (2 ♂, CAS), at  $16^{\circ}06.7'S$   $130^{\circ}25.4'E$  (1 ♂, CAS), at  $16^{\circ}06'42''S$   $130^{\circ}25'23''E$  (2 ♂, CAS), at  $16^{\circ}07'55''S$   $130^{\circ}26'11''E$  (1 ♂, ANIC; 3 ♂, CAS), at  $16^{\circ}10'49''S$   $130^{\circ}25'51''E$  (1 ♂, ANIC; 1 ♂, CAS), and at  $16^{\circ}12'47''S$   $130^{\circ}25'11''E$  (1 ♂, CAS), Keep River National Park at  $15^{\circ}45'30''S$   $129^{\circ}06'28''E$

(1 ♂, ANIC; 3 ♂, CAS), McArthur River 48 km SSW Borroloola at 16°27'S 136°05'E (1 ♀, ANIC), 7 mi. S Ti-Tree (4 ♂, CAS), Victoria Highway 38.5 km SW Timber Creek at 15°42'40"S 130°07'48"E (2 ♂, CAS). **Queensland:** 4 km NE Batavia Downs at 12°39'S 142°42'E (8 ♂, ANIC; 1 ♂, CAS), Bowling Green Bay National Park at 19°26.0'S 146°56.7'E (5 ♂, CAS), Coen at 13°57'S 143°12'E (2 ♂, ANIC), Dalrymple National Park at 19°49.3'S 146°05.3'E (1 ♀, CAS), Dipperu National Park at 21°53.9'S 148°46.5'E (2 ♀, CAS), Emerald (1 ♀, ANIC); Granite Gorge ca 6 km SW Mareeba (2 ♂, CAS), Hann River at 15°11'S 143°52'E (1 ♂, ANIC), Heathlands at 11°45'S 142°35'E (2 ♂, ANIC), Homevale National Park at 21°26.9'S 148°32.4'E (6 ♀, 4 ♂, CAS), 10 km S Moreton (3 ♂, ANIC), 3 km NE Mount Webb at 15°03'S 145°09'E (1 ♂, ANIC), Pinnacle Creek 27 km N Archer Crossing in Cape York (2 ♂, ANIC), 2 km N Rockeby at 13°39'S 142°40'E (1 ♂, ANIC), 1 km N Rounded Hill near Hope Vale Mission at 15°17'S 145°13'E (1 ♂, ANIC), Split Rock SE Laura at 15°39'S 144°31'E (4 ♂, ANIC) and 15°39'S 142°42'E (2 ♂, ANIC), 6 km N Taroom at 25°36'S 149°46'E (1 ♂, QMB), 13 km SE Weipa at 12°40'S 143°00'E (2 ♂, ANIC). **South Australia:** Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (15 ♀, 6 ♂, CAS), 3 km ENE Wilpena at 31°31.0'E 138°36.6'E (7 ♀, 4 ♂, CAS). **Western Australia:** 8 mi SE Belele (1 ♂, CAS), Bunyongia Spring at 31°26'S 123°33'E (1 ♀, WAM), 10 km W Cobra Station at 24°10.2'S 116°23.0E (1 ♀, 1 ♂, ANIC; 1 ♀, CAS; 1 ♀, USU), 12 km ENE Comet Vale Siding at 29°57'S 121°07'E (3 ♂, WAM), Ethel Creek 300 mi. N Meekatharra at 22°54'S 120°10'E (1 ♀, 16 ♂, WAM), Geraldton (2 ♂, BMNH, lectotypes of *Pison decipiens* and *Pison dimidiatum*, labeled Swan R.), Great Northern Highway at 23°02.6'S 118°50.2'E (1 ♀, CAS) and 23°54.3'S 119°45.4'E (1 ♂, CAS), Hamelin Telegraph Station at 26°23.9'S 114°09.9'E (4 ♂, CAS), Kennedy Range National Park at 24°38.7'S 115°10.7'E (1 ♂, ANIC), 25 km N Marble Bar at 20°56.2'S 118°51.0'E (1 ♂, ANIC), 1 km NE Millcreek Homestead at 21°35'S 117°04'E (1 ♀, ANIC), Mining Camp in Mitchell Plateau at 14°49'S 125°50'E (8 ♂, ANIC; 1 ♂, CAS), Moora (1 ♂, UCD), Mount Gibson Station, now Mount Gibson Sanctuary (1 ♀, WAM), Mundaring Weir (1 ♂, BMNH, lectotype of *Pison inconspicuum*), 45 km S Newman on Great Northern Highway at 23°42.4'S 119°44.3'E (1 ♂, CAS), 158 km S Newman (= 9 km N Kumarina Roadhouse) at 24°37.8'S 119°36.8'E (1 ♂, ANIC), 80 km S Pardoo Roadhouse at 20°28.3'S 120°10.0'E (8 ♂, CAS), 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E (1 ♀, ANIC).



FIGURE 282. Collecting localities of *Pison decipiens* F. Smith.

### *Pison dentatum* Pulawski, species nova

Figures 283-291.

**NAME DERIVATION.**—*Dentatum*, Latin neuter adjective meaning *with teeth*; with reference to the toothed mandibular apex.

**RECOGNITION.**—*Pison dentatum* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I.

The female has the lower gena (on each side of the oral fossa) shiny, unsculptured, and asetose, with the unsculptured area bordered by a psammophore; a well-defined psammophore is also present on the forefemur. It differs from other such species by the combination of two characters: the inner mandibular margin with two preapical teeth (Fig. 283), and the tegula entirely or largely punctate (with the marginal rim impunctate, Fig. 286). Subsidiary recognition features are: clypeal lamella non-tridentate, mandible black basally, without preapical teeth on inner margin. The mandible with two preapical teeth is also found in *P. tridentatum*, in which the occipital carina





Figures 283–287. *Pison dentatum* Pulawski, sp. nov. (283) Female clypeus and mandible; (284) Male clypeus and mandibles; (285) Female head in dorsal view; (286) Female tegula and adjacent scutum; (287) Basal flagellomeres of male.

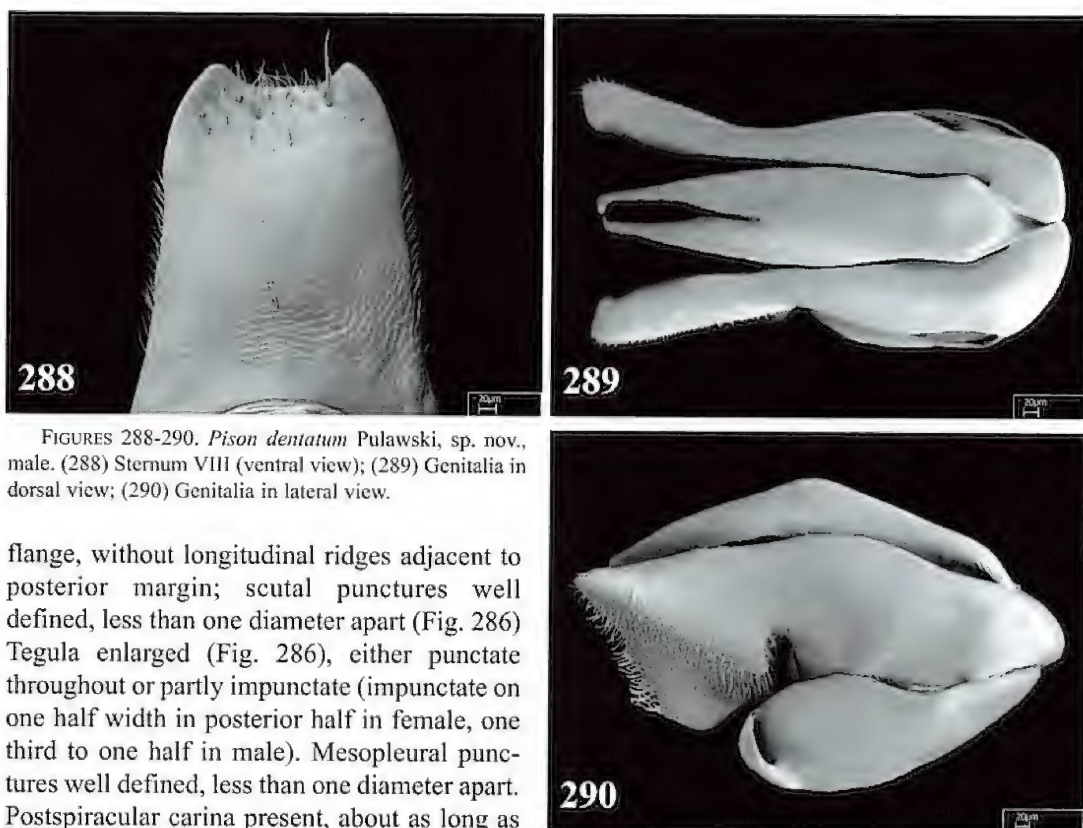
287

by the characters given under these species), with *P. contiguum* (in which the mandible is simple apically and yellowish basally), and with most *P. punctatum*, in which the mandible is simple apically and the gaster is red (all or partly).

The male can be recognized by the following combination: clypeal lamella rounded (with a small median point in some specimens), mandible bidentate apically (Fig. 284), and most of the tegula with well-defined punctures. The first two characters are shared with *tridentatum* in which, however, the mandible has a well-defined abductor ridge (ridge absent in *dentatum*), most of the tegula is impunctate, and the occipital carina is expanded ventrally, higher than the hypostomal carina (carina not expanded in *dentatum*).

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Gena narrow in dorsal view (Fig. 285). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate or finely foveate along





FIGURES 288-290. *Pison dentatum* Pulawski, sp. nov., male. (288) Sternum VIII (ventral view); (289) Genitalia in dorsal view; (290) Genitalia in lateral view.

flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart (Fig. 286) Tegula enlarged (Fig. 286), either punctate throughout or partly impunctate (impunctate on one half width in posterior half in female, one third to one half in male). Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina present, about as long as  $0.5 \times$  midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, microscopically punctate between ridges; side ridged (ridges conspicuous dorsally), punctate between ridges; posterior surface with well-defined, transverse ridges, punctate between ridges. Posteroventral forefemoral surface minutely, closely punctate. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I about one diameter apart on horizontal part, microscopic and close to each other on apical depression. Punctuation of sterna variable: in most specimens, sternum II impunctate apicomesally and sternum III aciculate and impunctate or with a few sparse punctures mesally; in specimens from 79 km NNW Renmark, most of sternum II (except basally and laterally) and sternum III with a few microscopic punctures; in specimen from 32 km N Renmark, sternum II punctate except on small apicomedian area, and sternum III punctate.

Setae silvery, suberect and as long as or shorter than midocellar diameter on upper frons, appressed on postocellar area, scutum, and tergum I; completely concealing integument on clypeus in female, nearly completely in male; see below for setae of lower gena. Apical depressions of terga I-IV in female, I-V in male, with silvery, setal fasciae

Body all black, mandible brown mesally.

♀.—Upper interocular distance equal to  $0.62-0.66 \times$  lower interocular distance; ocellocular distance equal to  $0.6-0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.2 \times$  hindocellar diameter; eye height equal to  $0.94-0.96 \times$  distance between eye notches. Free margin of clypeal lamella arcuate in most specimens (Fig. 283), but obtusely triangular in specimen from 32 km N Renmark and one from Brookfield Conservation Park. Dorsal length of flagellomere I

2.6-2.7  $\times$  apical width, of flagellomere IX 1.1-1.3  $\times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about 0.5-0.7  $\times$ , 0.6-0.7  $\times$ , and 0.7-0.9  $\times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible tridentate apically (Fig. 283), i.e., with two pre-apical teeth. Length 7.0-7.2 mm; head width 2.4-2.5 mm.

♂.—Upper interocular distance equal to 0.72-0.74  $\times$  lower interocular distance; ocellular distance equal to 0.7-1.1  $\times$  hindocellar diameter, distance between hindocelli equal to 1.1-1.3  $\times$  hindocellar diameter; eye height equal to 0.94-0.96  $\times$  distance between eye notches. Free margin of clypeal lamella either arcuate or with small median point (Fig. 284). Flagellum either cylindrical or flagellomeres III-VI slightly convex ventrally (Fig. 287). Dorsal length of flagellomere I 2.0  $\times$  apical width, of flagellomere X 1.0-1.3  $\times$  apical width. Mandible bidentate apically (Fig. 284). Setae of lower gena erect, up to about 1.5  $\times$  as long as midocellar diameter. Sternum VIII shallowly, broadly emarginate apically (Fig. 288). Genitalia: Figs. 289, 290. Length 6.1-6.3 mm; head width 1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 291).—New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**—**HOLOTYPE:** ♂, **AUSTRALIA:** **Queensland:** Hann River at 15°11'S 143°52'E, 17 Aug – 15 Sept 1993, P. Zborowski and S. Shattuck (ANIC).

**PARATYPES:** **AUSTRALIA:** **New South Wales:** 100 km SE Broken Hill at 32°51'S 141°37'E, 3-13 Oct 1988, E.D. Edwards (2 ♀, ANIC); **Northern Territory:** 22 km WSW Borroloola, 16 Apr 1976, D.H. Colless (1 ♀, CAS); Kakadu National Park: Ngarradj Warde Djokkeng at 12°27'S 132°55'E, 27 June 1980, I.D. Naumann (1 ♂, ANIC). **Queensland:** Hann River at 15°11'S 143°52'E, 17 Aug – 15 Sept 1993, P. Zborowski and S. Shattuck (1 ♀, 1 ♂, ANIC) and 15 Sept – 20 Oct 1993, P. Zborowski and D. Rentz (1 ♀, ANIC); Heathlands at 11°45'S 142°35'E, [no day] June – 25 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC); 3 km NE Mount Webb at 15°03'S 145°09'E, 1-30 Oct 1980, J.C. Cardale (1 ♂, ANIC; 1 ♀, CAS); Split Rock at 15°39'S 144°31'E, 24 June – 29 July 1992, P. Zborowski and E.S. Nielsen (1 ♀, 1 ♂, ANIC), 29 June – 24 Aug 1992, P. Zborowski and J.C. Cardale (1 ♀, ANIC), and 24 Aug – 21 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC); same data as holotype (1 ♂, ANIC). **South Australia:** Brookfield Conservation Park at 34°19'S 139°30'E, 4-20 Feb 1992, J. Stelman and S. Williams (1 ♀, ANIC; 1 ♂, CAS); 14 km WNW Renmark at 34°07'S 140°37'E, 28 Feb – 28 May 1995, K.R. Pullen (1 ♀, ANIC); 32 km N Renmark at 33°53'S 140°44'E, 9 Nov – 12 Dec 1995, K.R. Pullen (1 ♀, 1 ♂, ANIC); 79 km NNW Renmark at 33°31'S 140°24'E, 12 Dec 1995 – 25 Jan 1996, K.R. Pullen (1 ♀, ANIC; 1 ♀, CAS). **Western Australia:** 11 km E Marble Bar at Brockman Creek at 21°09.0'S 119°51.7'E, 2-14 May 2003, M.E. Irwin and F.D. Parker (1 ♂, CAS).



FIGURE 291. Collecting localities of *Pison dentatum* Pulawski, sp. nov.

### *Pison deperditum* Turner

Figures 292-301.

*Pison deperditum* Turner, 1917:109, ♀. Lectotype: ♀, Australia: Northern Territory: Darwin (BMNH), **present designation**, examined. – R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:258 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—Turner did not give the number of the specimens examined in the

original description of *Pison deperditum*. I have designated as the lectotype the only specimen present in The Natural History Museum, London, and labeled "Darwin, G.F. Hill" (as in the original description) and "*Pison deperditum* Turn., Type".

**RECOGNITION.**—*Pison deperditum* is one of the species in which the second recurrent vein is received near the middle of the second submarginal cell and the legs and gaster are ferruginous. It is unique in having the episcrobal area rugose or ridged (longitudinally or obliquely) and the mesopleuron below the scrobe rugose (the ridges and rugae are somewhat hidden by vestiture; they vary from evanescent to conspicuous). Additionally, the longitudinal ridges adjacent to the posterior margin of the scutum are well defined and about twice as long as those at the anterior margin of the scutellum, the tegula is partly impunctate (all punctate in *P. orbitale*), the distance between the antennal socket and adjacent eye margin is smaller than or equal to the socket width (more than the socket width in *P. virosum*), the propodeal dorsum is conspicuously rugose, and the middle clypeal lobe is well defined in the female (not differentiated in *P. frontale*).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Distance between antennal socket and orbit less than socket width in most specimens, but about equal to socket width in specimens from Darlington, Western Australia. Occipital carina expanded ventrally in some specimens, about as high as  $0.5 \times$  midocellar diameter. Labrum shallowly emarginate mesally. Gena narrow in dorsal view. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum distinctly foveate along flange, not foveate in one specimen from Darlington, with several well defined longitudinal ridges adjacent to posterior margin (ridges about twice as long as those near anterior margin of scutellum), flange expanding posteriorly in specimens from Darlington; surface either punctate (punctures less than one diameter apart), or irregularly, transversely ridged laterally, or irregularly, transversely ridged throughout (ridges varying from minute to conspicuous). Tegula somewhat enlarged, markedly elongate in specimens from Darlington. Mesopleural sculpture (Fig. 295) somewhat concealed by short, appressed vestiture (not concealed in some males with coarse sculpture); episcrobal area rugose or ridged (longitudinally or obliquely); area beneath scrobe partly rugose, nearly all rugose in some specimens (rugae or ridges varying from evanescent to conspicuous). Postspiracular carina present, up to  $2.0 \times$  as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus, with longitudinal ridges or rugae. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum conspicuously rugose except for median sulcus that is transversely ridged (Fig. 296), at least posteriorly, and in most specimens has a longitudinal carina, at least basally; side shiny, punctate, with several ridges dorsally and posteriorly; posterior surface conspicuously ridged except mesodorsally. Forewing with three submarginal cells; second recurrent vein received near middle of second submarginal cell. Hindcoxal dorsum with outer margin not carinate. Tergum I finely punctate, punctures averaging about one diameter apart. Sternum II punctate throughout, punctures microscopically small apicomesally.

Setae silvery, appressed on frons, thorax, and tergum I, erect on lower gena (setal length  $0.5 \times$  midocellar diameter), fully concealing integument on clypeus.

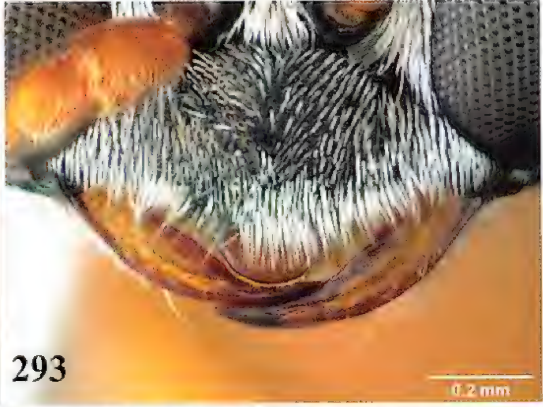
Head, thorax, and propodeum black, clypeal lip of female, most of mandible, and antenna ferruginous (apical flagellomere dark brown dorsally). Femora, tibiae, tarsi, and gaster ferruginous.

♀.—Upper interocular distance equal to  $1.20 \times$  lower interocular distance; ocellocular distance equal to  $0.6\text{--}0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9\text{--}1.0 \times$  hindocellar diameter; eye height equal to  $1.20 \times$  distance between eye notches. Free margin of clypeal lamella truncate or slightly convex, rounded laterally (Fig. 292). Dorsal length of flagellomere I  $2.6 \times$





292



293



294



295



296

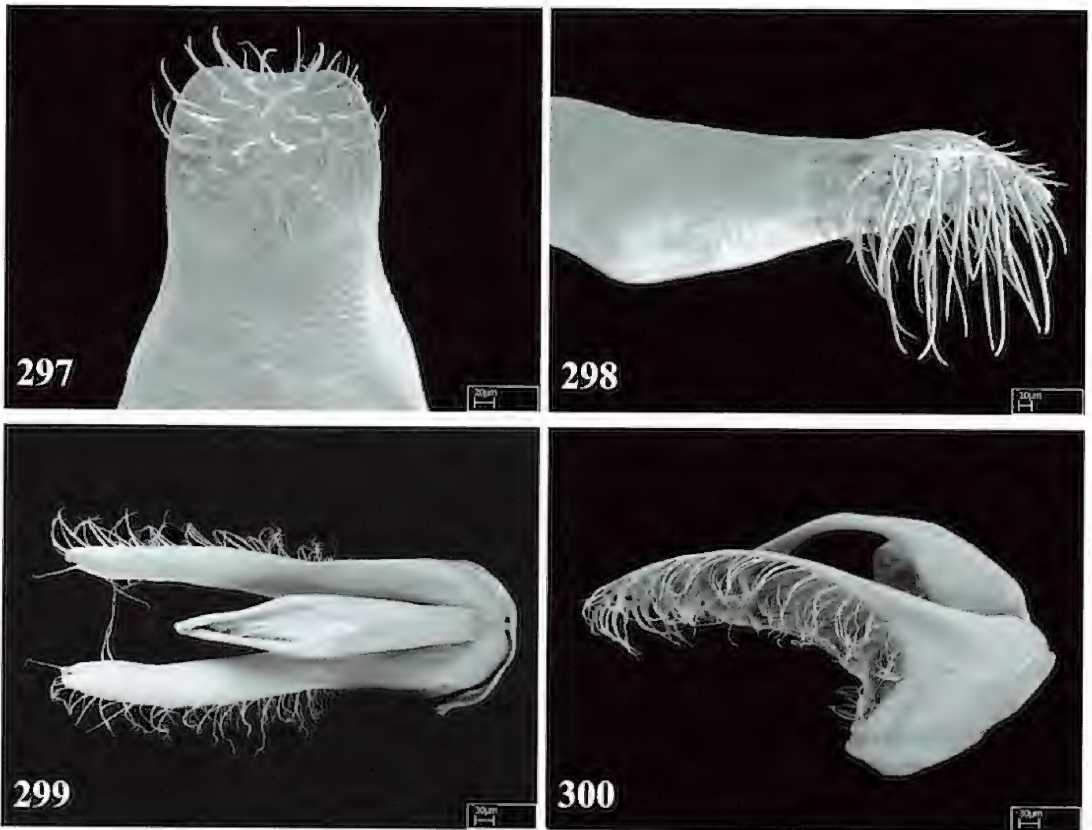
FIGURES 292-296. *Pison deperditum* Turner. (292) Female clypeus and mandibles; (293) Male clypeus and mandibles; (294) Posterior part of scutum and scutellum, showing longitudinal ridges adjacent to posterior scutal margin; (295) Mesopleuron of male; (296) Propodeal dorsum and posterior surface of female.

apical width, of flagellomere IX  $0.7 \times$  apical width. Mandible: trimmal carina with minute incision at about one third of its length. Length 6.2-6.5 mm; head width 2.1-2.2 mm.

♂.— Upper interocular distance equal to  $1.10 \times$  lower interocular distance; ocellocular distance equal to  $0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.20 \times$  distance between eye notches. Free margin of clypeal lamella rounded (Fig. 293). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere X  $0.8 \times$  apical width. Sternum VIII roundly truncate apically (Fig. 297), convex basoventrally (Fig. 298). Genitalia: Figs. 299, 300. Length 6.1-6.2 mm; head width 2.0-2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 301).— New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **AUSTRALIA:** New South Wales: Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (1 ♂, ANIC; 1 ♀, CAS). Northern Territory: Bessie Spring 8 km ESE Cape Crawford at  $16^{\circ}40'S$   $135^{\circ}51'E$  (1 ♀,



FIGURES 297-300. *Pison deperditum* Turner, male. (297) Male sternum VIII (ventral surface); (298) Male sternum VIII in lateral oblique view; (299) Genitalia in dorsal view; (300) Genitalia in lateral view.

ANIC), Border Waterhole 15 km SW Musselbrook at 18°37'S 137°59'E (1 ♂, ANIC), Buchanan Highway 31 km SSE Victoria Highway at 15°57'37"S 130°38'20"E (4 ♀, 1 ♂, ANIC; 5 ♀, CAS), Darwin (as Port Darwin, 1 ♀, BMNH, lectotype of *Pison deperditum*; 1 ♀, NTM), Gregory National Park at 16°00'52"S 130°48'18"E (2 ♀, ANIC), 16°01'45"S 130°47'36"E (1 ♂, CAS), and 16°03'01"S 130°24'07"E (1 ♀, ANIC; 2 ♀, CAS), Horn Islet (3 ♀, QMB), Jim Jim Falls in Kakadu National Park (2 ♂, ANIC; 1 ♀, CAS), Keep River National Park at 15°57'55"S 129°01'52"E (1 ♀, ANIC; 2 ♀, 1 ♂, CAS), Leichardt Gallery in Deaf Adder Valley (2 ♂, ANIC), Nourlangie Rock in Kakadu National Park (2 ♀, ANIC), Nourlangie Rock: Nangaloar in Kakadu National Park (5 ♀, ANIC), Oberie Rock 2 km NNW Cahills Crossing on East Alligator River at 12°25'S 132°57'E (1 ♂, ANIC), Sterling Creek crossing on Buntine Highway at 17°40'36"S 130°00'24"E (1 ♂, ANIC), Virginia 31 km SE Darwin Central Business District at 12°33'S 131°02'E (1 ♀, NTM), Waterhouse Range 39 km SSW Alice Springs at 23°59'S 133°38'E (1 ♀, ANIC). **Queensland:** Almaden (1 ♀, AMS), Split Rock 14 km SE Laura at 15°39'S 144°31'E (73 ♀, 14 ♂, ANIC; 4 ♂, CAS), Townsville (2 ♀, UCD). **South Australia:** 15-25 mi. SE Amata (1 ♂, USNM,



FIGURE 301. Collecting localities of *Pison deperditum* Turner.



as Musgrave Park), Victory Well in Everard Park Station at 27°S 132.7°E (1 ♀, SAM). **Western Australia:** Carson escarpment at 14°49'S 126°49'E (1 ♀, ANIC), 14 km SE Kalumburu Mission at 14°25'S 126°40'E (1 ♀, ANIC), Mining Camp in Mitchell Plateau at 14°49'S 125°50'E (1 ♀, ANIC), Nanutarra-Wittenoom road at 22°21'22"S 117°54'16"E (1 ♀, AMS), Perth: Darlington (2 ♀, WAM).

***Pison deplanatum* Pulawski, species nova**

Figures 302-308.

**NAME DERIVATION.**—*Deplanatum* is a Latin neuter adjective meaning *flattened*; with reference to the shape of the thoracic dorsum of this species.

**RECOGNITION.**—*Pison deplanatum* has only two submarginal cells, the second being 1.9-2.2× as long posteriorly as high (Fig. 306), the tegula impunctate and asetose in posterior half, and the propodeum without a longitudinal carina separating the side from the dorsum and the posterior surface. It is the only *Pison* in which the eye is covered with erect setae above the emargination only (Fig. 303). In the female, the clypeal free margin (Fig. 302) has no middle lobe (minimally prominent mesally, not concave laterally). *Pison globosum* is similar, but in the female of *P. deplanatum* the forefemur is conspicuously thickened (Fig. 307) rather than insignificantly thickened, the frons is finely punctate, somewhat shiny between the punctures (rather than minutely reticulate, dull), the postocellar area has a transverse sulcus adjacent to the hindocelli (sulcus absent), the eye above the emargination (Fig. 304) covered with erect setae (rather than asetose), the scutellum is flat, situated in the same plane as the scutum and not foveate anteriorly (rather than slightly convex, slightly raising above the scutum level, and foveate anteriorly), the propodeal dorsum is finely obliquely ridged, punctate between ridges, only punctate along lateral margin (rather than irregularly, transversely ridged, impunctate), the propodeal side is unsculptured anteriorly or nearly so (rather than all sculptured), and the wing veins (all or most) are pale yellow brown in basal half (rather than all black). Like *P. difficile* and unlike the other species with two submarginal cells, the scutellum has no foveate sulcus along the anterior margin. The male is unknown.

**DESCRIPTION.**—Frons markedly convex, minutely punctate, punctures about one diameter apart; interspaces microsculptured but slightly shiny; middle supraantennal carina replaced by fine sulcus. Distance between antennal socket and orbit smaller than socket width. Midocellus smaller than hindocellus (Fig. 303). Postocellar area with transverse sulcus adjacent to hindocelli. Gena narrow in dorsal view (Fig. 304). Labrum minimally emarginate. Pronotal collar elongate (Fig. 305), its horizontal part about 2.5 × as long as hindocellar diameter. Anteromedian pronotal pit absent. Propleuron sparsely punctate anterolaterally. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures minute, averaging about one diameter apart; interspaces microsculptured. Tegula enlarged. Scutellum flattened, at same level as scutum, evenly sculptured, without foveate sulcus anteriorly between axillae. Mesopleural punctures fine, 1-2 diameters apart; interspaces unsculptured. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum elongate, 2.0-2.5 × as long as scutellum, finely obliquely ridged, punctate between ridges, only punctate along lateral margin; side slightly concave, punctate except anteriorly (impunctate on most surface in some specimens), minutely ridged anteriorly in some specimens; posterior surface punctate, also with evanescent ridges in some specimens. Forewing with two submarginal cells (Fig. 306); second submarginal cell 1.9-2.2 × as long posteriorly as high. Posteroventral forefemoral surface minutely punctate, punctures averaging about two diameters apart. Hindcoxal dorsum with outer margin blunt. Punctures of tergum I fine, about





302

0.2 mm



303

0.2 mm



304

0.1 mm



305

0.1 mm



306

0.2 mm



307

0.2 mm

FIGURES 302–307. *Pison deplanatum* Pulawski, sp. nov., female. (302) Clypeus and mandibles; (303) Head in frontal view; (304) Head in dorsal view; (305) Pronotum; (306) Distal portion of forewing; (307) Forefemur.

one diameter apart (some punctures about two diameters apart in some specimens). Sterna punctate throughout.

Setae silvery, appressed on frons, lower gena, thorax, forecoxal venter, femoral venters, and tergum I; partly concealing integument on clypeus. Eye above emargination covered with erect setae (Fig. 303). Apical depressions of terga with ill-defined, silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, mandible ferruginous (black basally, brown apically), flagellum black or yellowish brown ventrally. Wing veins (all or most) pale yellow brown in basal half. Femora black, foretibia and foretarsus ferruginous in most specimens, all tibiae and tarsi ferruginous in specimens from Mount Cook National Park and Shiptons Flats, Queensland.

♀.—Upper interocular distance equal to  $1.00\text{--}1.05 \times$  lower interocular distance; ocellular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.7 \times$  hindocellar diameter; eye height equal to  $1.04\text{--}1.08 \times$  distance between eye notches. Free margin of clypeal lamella without lobe, almost evenly arcuate except slightly prominent mesally, not concave laterally (Fig. 302). Dorsal length of flagellomere I  $1.3\text{--}1.4 \times$  apical width, of flagellomere IX  $0.9\text{--}1.1 \times$  apical width. Mandible: trimmal carina with minute incision shortly before midlength. Forefemur markedly swollen (Fig. 307). Tergum VI with median carina apically. Length 5.3–6.5 mm; head width 1.3–1.4 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 308).—Australian Capital Territory, eastern New South Wales, eastern Queensland.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Australian Capital Territory: Black Mountain, Dec 1982, I.D. Naumann and J.C. Cardale (ANIC).

PARATYPES: AUSTRALIA: Australian Capital Territory: same data as holotype (1 ♀, ANIC); same data as holotype except Nov 1982 (1 ♀, ANIC). New South Wales: Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , 28 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Shoalhaven River 30 km W Nowra, 25 Dec 1986, G.A. Holloway (1 ♀, AMS). Queensland: Carnarvon National Park at  $25^{\circ}03.6'S$   $148^{\circ}14.1'E$ , 1 Dec 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Crediton State Forest at  $21^{\circ}11.8'S$   $148^{\circ}29.9'E$ , 2 Nov 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$ , 31 Oct 2006, V. Ahrens and W.J. Pulawski (2 ♀, CAS); George Creek 27.5 km W Bries Homestead at  $19^{\circ}32'53"S$   $143^{\circ}56'33"E$ , 3–5 Nov 2001, D. Yeates, C. Lambkin, N. Stanick, and J. Hamilton (1 ♀, AMS); Mount Cook National Park at  $15^{\circ}29'S$   $145^{\circ}16'E$ , 10–12 May 1981, I.D. Naumann (1 ♀, ANIC); Shiptons Flats at  $15^{\circ}47'S$   $145^{\circ}14'E$ , 17–19 Oct, J.C. Cardale (1 ♀, ANIC).



FIGURE 308. Collecting localities of *Pison deplanatum* Pulawski, sp. nov.

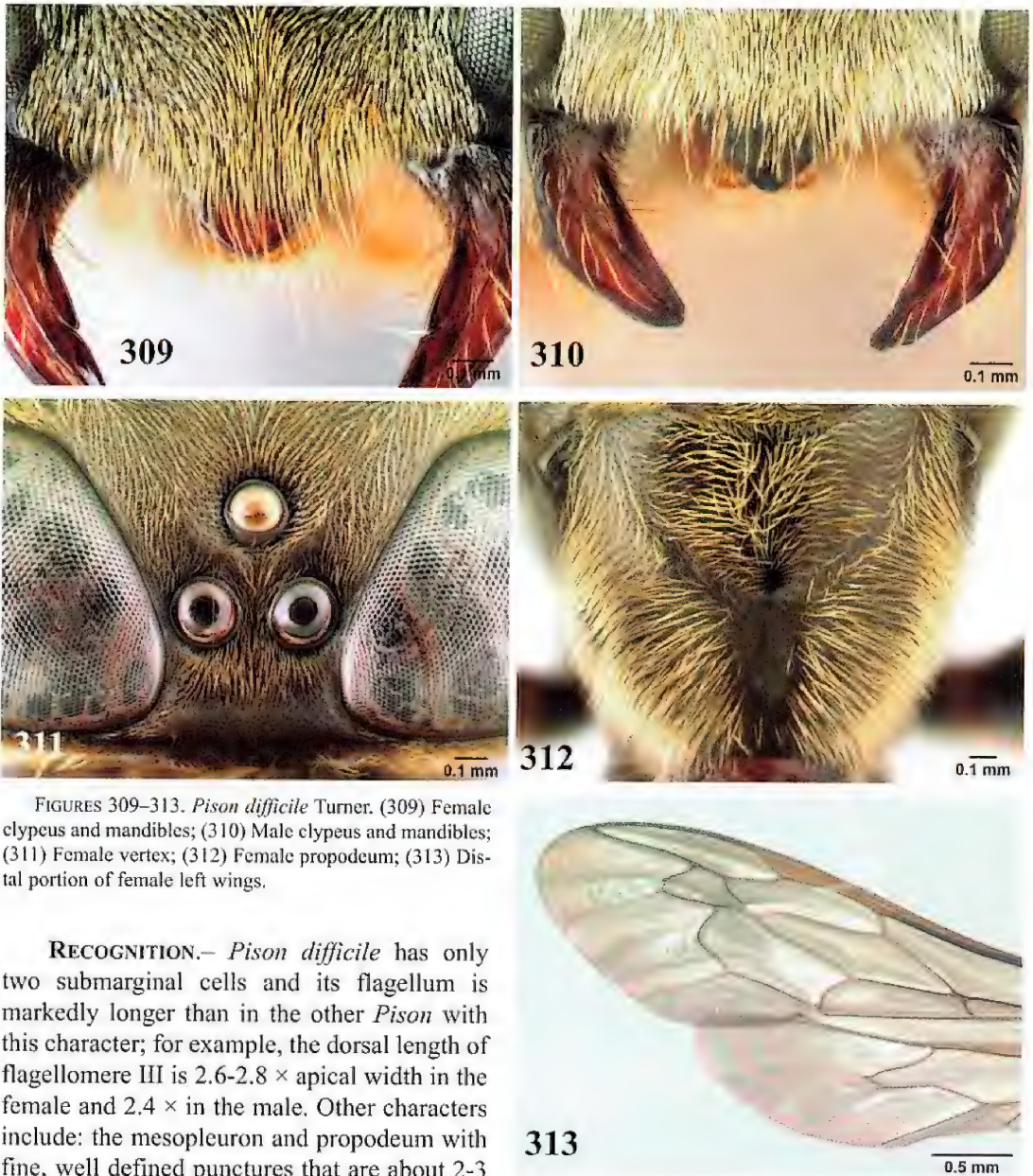
### *Pison difficile* Turner

Figures 309–319.

*Pison difficile* Turner, 1908:520, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH). **present designation**, examined. — Turner, 1916b:595 (in key to Australian *Pison*), 599 (resembling *Icaria socialis* de Saussure, now *Ropalidia socialis*); Menke, 1968a:3 (has a semipetiolate gaster); R. Bohart and Menke, 1976:337 (in checklist of world Sphecidae); Cardale, 1985:263 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—Turner did not indicate the number of specimens examined in the original description of *Pison difficile*. Of the two specimens of this species present in The Natural History Museum, I have labeled one as the lectotype and the other as a paralectotype.



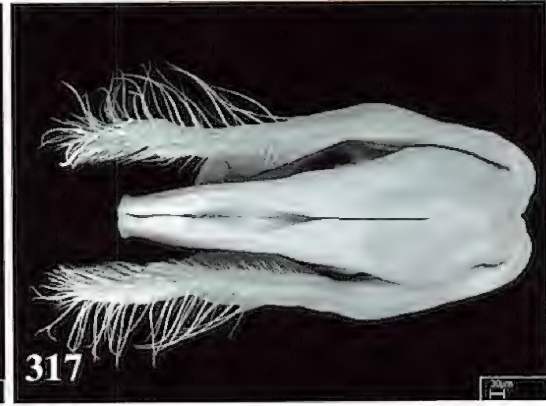
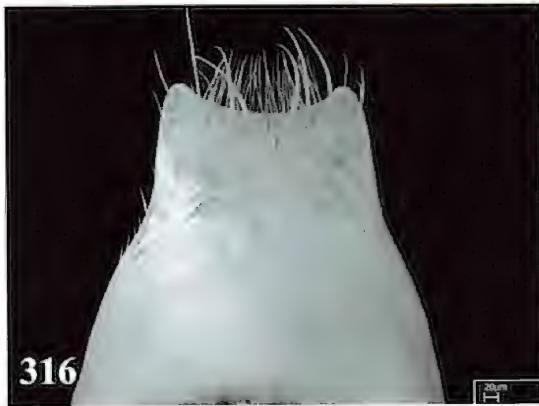


FIGURES 309–313. *Pison difficile* Turner. (309) Female clypeus and mandibles; (310) Male clypeus and mandibles; (311) Female vertex; (312) Female propodeum; (313) Distal portion of female left wings.

**RECOGNITION.**— *Pison difficile* has only two submarginal cells and its flagellum is markedly longer than in the other *Pison* with this character; for example, the dorsal length of flagellomere III is  $2.6\text{--}2.8 \times$  apical width in the female and  $2.4 \times$  in the male. Other characters include: the mesopleuron and propodeum with fine, well defined punctures that are about 2-3 diameters apart and with unsculptured, shiny interspaces, the propodeum without a longitudinal carina separating the side from the dorsum and posterior surface, an elongate tergum I (length  $1.45\text{--}1.70 \times$  apical width), sternum II largely impunctate, the femoral apices, tibiae, and tarsi ferruginous, and tergum I (all or partly) yellowish white or pale yellow; in the female, the clypeal lip is markedly, obtusely protruding (Fig. 309). Like *P. deplanatum* and unlike the other species with two submarginal cells, the scutellum is not foveate along the anterior margin.

**DESCRIPTION.**— Frons microsculptured, dull, minutely, shallowly punctate, punctures 2-3 diameters apart. Flagellum unusually long (e.g., dorsal length of flagellomere III  $2.6\text{--}2.8 \times$  apical width in female,  $2.5 \times$  in male). Labrum not emarginate. Anteromedian pronotal pit trans-





FIGURES 314–318. *Pison difficile* Turner, (314) Female gaster with predominantly ferruginous tergum I; (315) Female gaster with predominantly black tergum I; male: (316) Sternum VIII (ventral view); (317) Genitalia in dorsal view; (318) Genitalia in lateral view.

versely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, averaging about one diameter apart. Mesopleuron with fine but well defined punctures that are about 2-3 diameters apart. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus may be costulate between dorsal and ventral metapleural pits (left and right sides may be different in same specimen). Propodeum all punctate (punctures averaging about 1-2 diameters apart, interspaces unsculptured, shiny), without longitudinal carina separating side from dorsum and posterior surface; dorsum without middle carina (Fig. 312). Hindcoxal dorsum not carinate on outer side. Forewing with two submarginal cells (Fig. 313); length of posterior margin of second submarginal cell  $1.9-2.2 \times$  height. Tergum I elongate (length  $1.45-1.70 \times$  apical width), sloping gently toward base, markedly less so than in most other *Pison*, with minute punctures that average several diameters apart. Sternum II largely impunctate except for a few minute, sparse punctures, densely punctate laterally.

Setae golden on whole body, appressed on scutum and tergum I, erect on lower gena, as long there as one midocellar diameter; forming conspicuous setal fasciae on apical depressions of terga.

Head, thorax, and propodeum black except the following are ferruginous: clypeal lip largely, mandible mesally, flagellum (apex black), and pronotal lobe posteriorly. Wings slightly infumate; humeral plate ferruginous or partly brown. Femora black except ferruginous apically, tibiae and tarsi ferruginous. Tergum I all or partly ferruginous or pale yellow (Figs. 314, 315); terga II-IV or II-VI black except tergum II narrowly ferruginous basolaterally and apical depressions brown; terga V and VI ferruginous in one specimen.

♀.— Upper interocular distance equal to  $0.50-0.52 \times$  lower interocular distance; ocellocular distance equal to  $0.3-0.4 \times$  hindocellar diameter, distance between hindocelli  $0.6 \times$  hindocellar diameter (Fig. 311); eye height equal to  $1.06-1.10 \times$  distance between eye notches. Clypeal lip markedly, obtusely angulate (Fig. 309). Dorsal length of flagellomere I  $2.8-3.2 \times$  apical width, of flagellomere III  $2.6-2.8 \times$  apical length, of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 9.3-10.4 mm; head width 2.4-2.7 mm.

♂.— Upper interocular distance equal to  $0.5-0.6 \times$  lower interocular distance; ocellocular distance equal to  $0.5-0.6 \times$  hindocellar diameter, distance between hindocelli  $0.7 \times$  hindocellar diameter; eye height equal to  $1.12-1.14 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate to approximately rectangular (Fig. 310). Dorsal length of flagellomere I  $2.5-2.9 \times$  apical width, of flagellomere III  $2.3-2.5 \times$  apical length, of flagellomere X  $1.4-1.5 \times$  apical width. Sternum VIII shallowly emarginate apically (Fig. 316). Genitalia: Figs. 317-318. Length 6.5-9.4 mm; head width 1.9-2.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 319).— Eastern New South Wales, northern part of Northern Territory, eastern Queensland, Papua New Guinea.

**RECORDS.**— **AUSTRALIA:** New South Wales: Gibraltar Range National Park (1 ♀, CAS), Iluka Nature Reserve at Clarence River (4 ♀, AMS), 0.5 km SE Lansdowne near Taree (1 ♀, ANIC), Wilson River Reserve 15 km NW Bellangry (1 ♀, AMS). **Queensland:** Brisbane (1 ♀, QMB), Brisbane Forest Park at  $27^{\circ}25'S$   $152^{\circ}50'E$  (1 ♂, MNKB), Cairns (1 ♀, CAS), near Curtain Fig Tree via Yungaburra (4 ♀, ANIC), Eurimbula at  $24^{\circ}11'S$   $151^{\circ}50'E$  (1 ♀, AMS), 12 km SSE Heathlands at



FIGURE 319. Collecting localities of *Pison difficile* Turner.

11°51'S 142°38'E (2 ♀, ANIC; 1 ♀, 1 ♂, CAS), Mackay (2 ♀, BMNH, lectotype and paralectotype of *Pison difficile*), Mission Beach (5 ♀, AMS), Paluma Range National Park at 18°51.6'S 146°07.6'E, altitude ca 50 m (1 ♀, CAS), and 18°58.6'S 146°09.6'E, altitude ca 900 m (1 ♀, CAS), Port Douglas (1 ♂, AMS), 18 km S Ravenshoe (1 ♀, AMS), Tamborine (1 ♀, QMB), Tully (1 ♀, QMB), Woodford (1 ♀, QMB).

PAPUA NEW GUINEA: EAST SEPIK PROVINCE: Bainyik at 3°40'0"S 143°3'0"E (1 ♀, BISH).

***Pison dispar* Pulawski, species nova**

Figures 320-328.

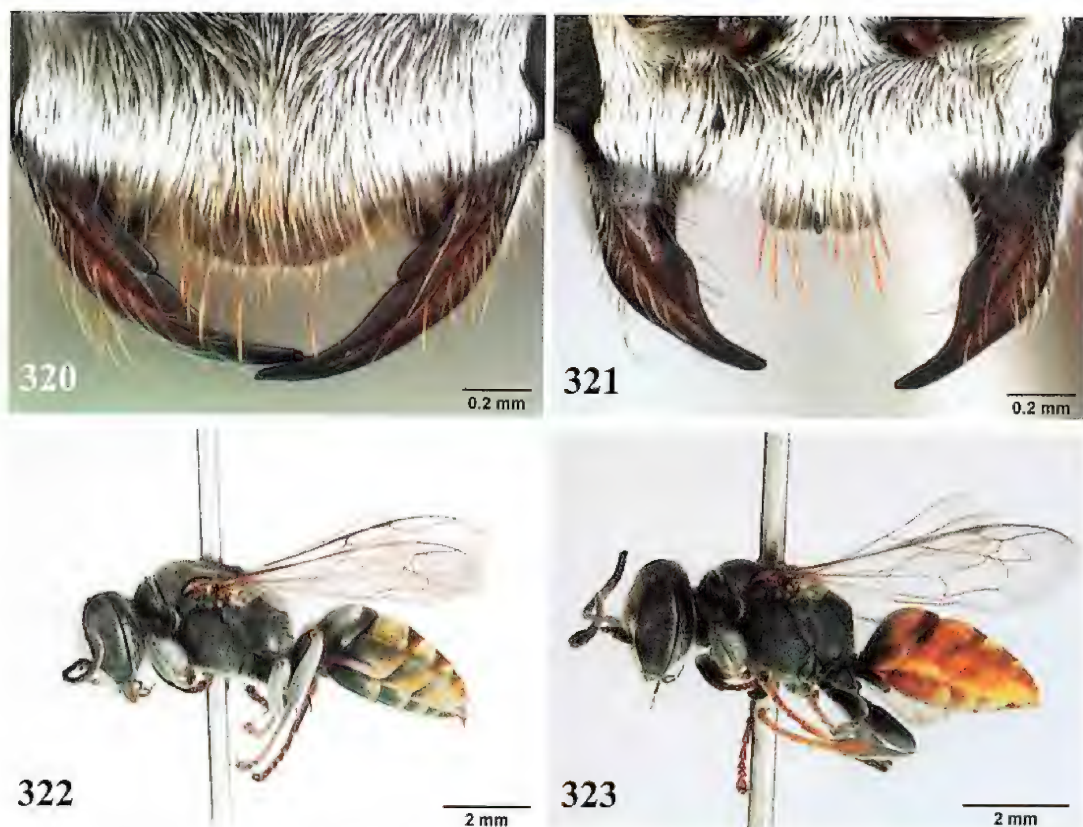
**NAME DERIVATION.**— *Dispar* is a Latin adjective (the same for all three genders), meaning *unequal, disparate, unlike*; with reference to the different coloration of the female and male.

**RECOGNITION.**— *Pison dispar* is characterized by the presence of erect setae of tergum I. The male is unique among the species with this feature in having the gaster all or largely ferruginous (Fig. 323) rather than all black), and a subsidiary diagnostic feature is the shape of flagellomeres III-VI (Fig. 324) that are concave basoventrally (at least slightly so) and slightly convex near midlength. In both sexes, furthermore, the mandibular apex is simple, the frontal punctures are small, no more than  $0.1-0.2 \times$  midocellar diameter, the gena is punctate and setose on both sides of the oral fossa, the scutal punctures are less than one diameter apart, the mesopleural punctures are less than one diameter apart at the center, the basodorsal hindcoxal tooth is not particularly high, the apical depression of tergum I is inconspicuous, almost in the same plane as the adjacent more anterior part of tergum, and sterna III and IV are abundantly punctate. The propodeum, in most specimens, has a longitudinal carina extending from gastropodeal articulation toward the spiracle, but in some specimens the longitudinal carina is replaced by a series of short, transverse ridges. The female is all black (Fig. 322), and is characterized by a well-defined median clypeal lobe (Fig. 320). Unlike *P. ecarinatum*, its ocellular distance is  $0.9-1.2 \times$  hindocellar diameter (rather than  $1.4-1.9$ ). Unlike *P. tibiale*, its clypeal lamella is not divided by a transverse sulcus (divided in *P. tibiale*). In both sexes, the inclined part of tergum I has fine, dense punctures and also somewhat larger punctures that are several to many diameters apart, unlike *P. ocellare* (in which the inclined part of tergum I is uniformly, finely punctate). Also diagnostic is the presence of erect setae in the basal half only of the hindfemoral venter.

**CORRESPONDENCE OF SEXES.**— Because of the difference in the color of the gaster (Figs. 322, 323), the correspondence of the sexes is not apparent. The specimens from Magnetic Island, however, both females and males, were reared from artificial nests. The only other *Pison* obtained there were *P. auratum* and *P. peletieri*, both very different species, so that the sex association with one of them is out of the question.

**DESCRIPTION.**— Frons dull, shallowly punctate, punctures about one diameter apart in female, less than one diameter apart in male. Hypostomal carina slightly expanded. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate on each side near middle. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula enlarged. Mesopleural punctures nearly compressed. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, but in some specimens carina replaced by series of short, transverse ridges; dorsum irregularly, obliquely ridged, punctate between ridges, side ridged, punctate between ridges; posterior surface conspicuously ridged, punctate between ridges, with several ridges radiating up from transverse carina just above gastropodeal articulation. Punctures of tergum I fine, averaging about





FIGURES 320-324. *Pison dispar* Pulawski, sp. nov. (320) Female clypeus and mandibles; (321) Male clypeus and mandibles; (322) Female body in lateral view; (323) Male body in lateral views; (324) Male flagellum.

one diameter apart before apical depression mesally; basal slope with fine punctures more than one diameter apart and with somewhat larger punctures many diameters apart. Punctures of sternum II 2-3 diameters apart, more than that in some specimens.

Setae silvery, erect on frons, thorax, propodeum, forecoxal venter, femoral venters (only in basal half of hindfemoral venter), and on tergum I, oriented dorsally in dorsal half of frons; setal length (measured against midocellar diameter): about  $1.5 \times$  on frons, about  $1.0 \times$  on scutum, up to  $1.5 \times$  on tergum I; not completely concealing integument on clypeus in female, nearly completely so in male; gena with subappressed setae about  $0.5 \times$  as long as midocellar diameter, and also with erect, nearly straight setae, about as long as  $2.0 \times$  midocellar diameter. Apical depressions of terga with golden setal fasciae (fasciae silvery in worn specimens).

Head, thorax, and propodeum black; mandible reddish mesally; male flagellum black or yellowish brown. Femora, tibiae, and tarsi black, tibiae partly ferruginous and tarsi all ferruginous





FIGURES 325-327. *Pison dispar* Pulawski, sp. nov., male. (325) Sternum VIII (ventral view); (326) Genitalia in dorsal view; (327) Genitalia in lateral view.

in some males. Gaster black in female, ferruginous in male (tergum I and base of II black in some specimens).

♀ (Fig. 322).— Upper interocular distance equal to  $0.70-0.76 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8-0.9 \times$  hindocellar diameter; eye height equal to  $0.88-0.90 \times$  distance between

eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 320). Dorsal length of flagellomere I  $2.5-2.8 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 10.1-10.6 mm; head width 3.1-3.2 mm.

♂ (Fig. 323).— Upper interocular distance equal to  $0.84-0.92 \times$  lower interocular distance; ocellocular distance equal to  $1.4-2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.5 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 321). Flagellomeres III-VI concave basoventrally, slightly convex near midlength (Fig. 324). Dorsal length of flagellomere I  $2.3-2.5 \times$  apical width, of flagellomere X  $1.1-1.2 \times$  apical width. Sternum VIII broadly emarginate (Fig. 325). Genitalia: Figs. 326, 327. Length 7.1-8.7 mm; head width 2.4-2.7 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 328).— New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, AUSTRALIA: Queensland: Arcadia on Magnetic Island, 2 Nov 1998, R.W. Matthews (ANIC).

**PARATYPES:** AUSTRALIA: New South Wales: Warrumbungle National Park at  $31^{\circ}16'S$   $148^{\circ}57'E$ , 17 Dec 1995, M.E. Irwin (2 ♀, 1 ♂, MNKB). Northern Territory: John Hayes Rockhole in Trephina Gorge Nature Park at  $23^{\circ}32'S$   $134^{\circ}21'E$ , 10 Apr 1981, M. Malipatil and J. Hawkins (1 ♂, NTM). Queensland: Arcadia on Magnetic Island, R.W. Matthews, 5 Nov 1998 (1 ♀, ANIC; 2 ♀, 2 ♂, CAS) and 2 Dec 1998 (4 ♀, 1 ♂, ANIC); 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$ , 18 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC), 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (2 ♂, ANIC), 22 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♂, ANIC), and 16 Sept – 24 Oct 1992, P. Zborowski and T. Weir (1 ♂, ANIC), 24 Oct – 23 Nov 1992, P. Zborowski and A. Calder (1 ♂, ANIC), 11 Dec 1992 – 17 Jan 1993, P. Zborowski



(1 ♂, ANIC); 3 km W Batavia Downs at 12°40'S 142°39'E, 16 Sept – 24 Oct 1992, P. Zborowski and T. Weir (1 ♂, ANIC) and 23 Nov – 11 Dec 1992, P. Zborowski and W. Dressler (1 ♂, ANIC); Brisbane, 15 Dec 1914, H. Hacker (1 ♂, USNM); Brisbane: Blunder Creek, 16 Nov 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♀, QMB); Brookhill at Flinders Highway and Stuart Creek at 19°23'S 146°50'E, 6 Mar 1996, J.E. Purdie (1 ♀, NTM); Cape York: no specific locality, N.W. Rodd, 2 and 4 June 1985 (2 ♂, AMS) and 2 Aug 1986 (3 ♂, AMS); Carnarvon Range, 14 Dec 1938, N. Geary (1 ♀, AMS); Coast Range ca. 17 km S Biggenden, 13 Mar 1983, H. Frauca (1 ♂, ANIC), 9 km S Dingo Beach at 20°10'S 148°30.5'E, 7 Nov 2006, W.J. Pulawski (1 ♂, CAS); Edungalba, 1 Jan 1987, H. and A. Howden (1 ♂, ANIC); Pendland at 20°31.0'S 145°24.2'E, 19 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 2 km N Rokeby at 13°39'S 142°40'E, 16 Nov – 17 Dec 1993, P. Zborowski (1 ♂, ANIC); Split Rock 14 km SE Laura at 15°39'S 144°31'E (1 ♂, ANIC); Vandyke, 23 Nov 1972, C.G. Roche (1 ♀, CAS); Whitsunday Islands: Hook Island, 30 Sept 1981, D.C. and R. Geijskes (1 ♀, RMNH). **South Australia:** Kings Mill Creek near Arkaroola Homestead, 29 Oct 1969, G.E. Gross (1 ♀, SAM); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, 21 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Western Australia:** Derby, 9 Mar 1962, P. Slater (1 ♀, RMNH); 12 km NE Giles in Rawlinson Range at 25°02'S 128°18'E, 14 Jan 1990, T.F. Houston and M.S. Harvey (1 ♂, WAM); 82 km S junction with Karijini Drive on Great Northern Highway at 23°07.3'S 119°05.5'E, 23 Apr – 16 May 2003, M.E. Irwin and F.D. Parker (1 ♂, CAS); Karijini National Park at 22°28.4'S 118°32.6'E, 23 Apr – 4 May 2003, F.D. Parker and M.E. Irwin (1 ♂, ANIC); 133 km SW Marble Bar at 21°41.6'S 119°04.8'E, 3–16 May 2003, M.E. Irwin and F.D. Parker (1 ♂, ANIC); Mardie Station at 21°11.3'S 115°58.9'E, 21–23 May 2003, F.D. Parker and M.E. Irwin (1 ♂, CAS).



FIGURE 328. Collecting localities of *Pison dispar* Pulawski, sp. nov.

### *Pison dives* Turner

Figures 329–339.

*Pison dives* Turner, 1916b:608, ♀. Lectotype: ♀, Australia: Queensland: Kuranda (BMNH), **present designation**, examined. – Turner, 1916b:597 (in key to Australian *Pison*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—Turner did not mention the number of the specimens examined in the original description of *Pison dives*. I have designated as the lectotype the only existing specimen in The Natural History Museum, London.

**RECOGNITION.**—*Pison dives* is an all black species except for the golden tergal setae, with three submarginal cells. It is unique among such species in having the anterior half of the tergal margin straight or minimally concave, clearly contrasting with the rounded posterior half. The species is further characterized by the black, erect setae on the upper frons (Fig. 332), postocellar area, scutum, scutellum, and metanotum, the frontal (Fig. 331) and mesopleural punctures more than one diameter apart, with the interspaces conspicuously microsculptured and dull, and the sterna densely punctate throughout. Many females have numerous although sparse erect setae on tergum I; in the male the setae of tergum I are mostly appressed but a few are erect in several specimens. Additionally, male tergum VII is emarginate apically, whereas sternum VIII is rounded apically (Fig. 336).

**DESCRIPTION.**—Frons dull, conspicuously microsculptured, shallowly punctate, punctures



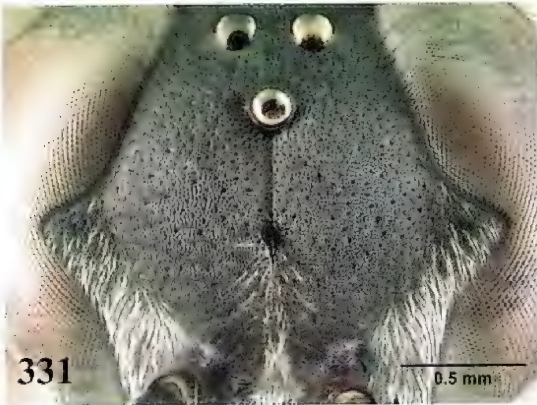
329

0.1 mm



330

0.1 mm



331

0.5 mm



332

0.5 mm



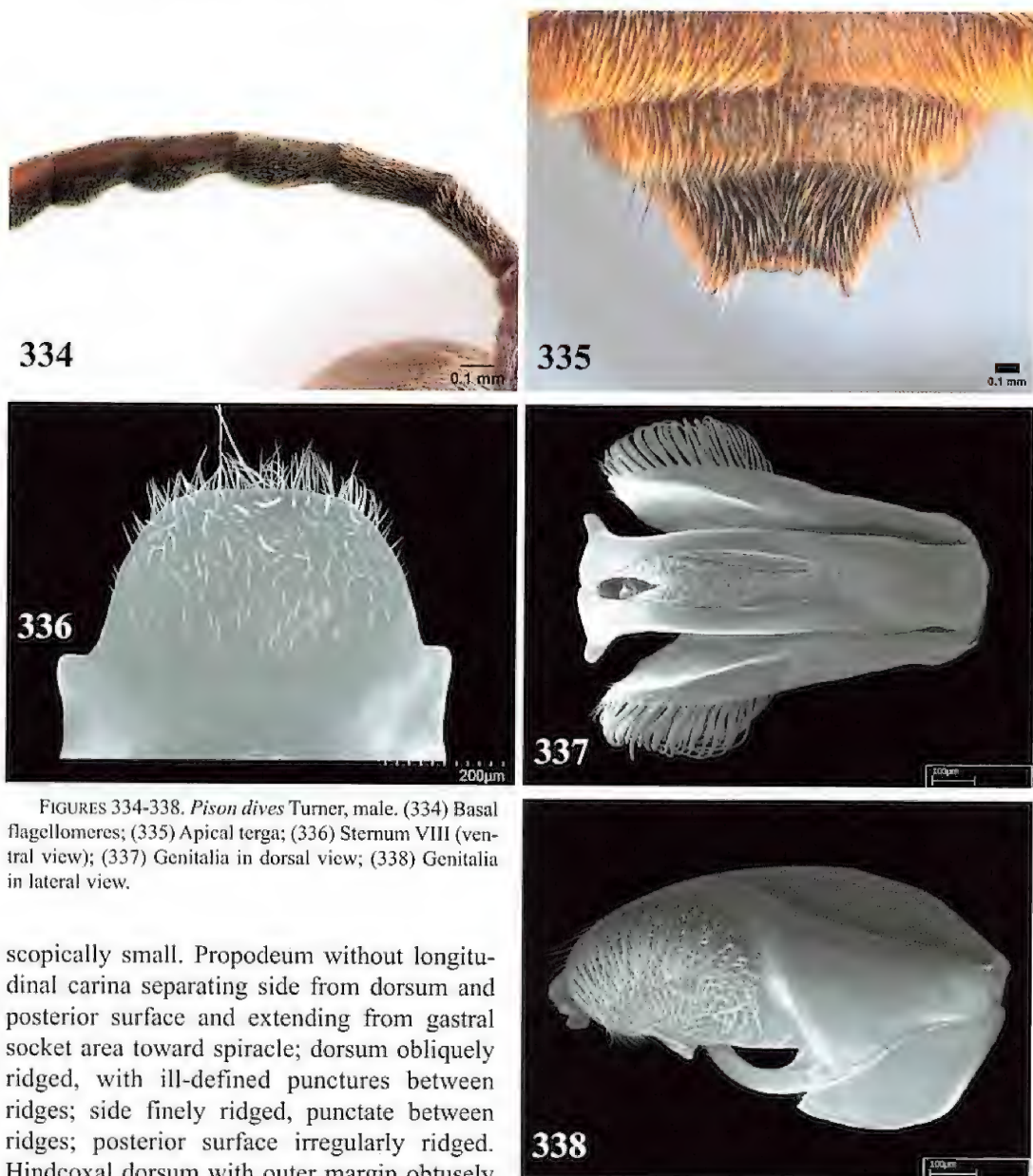
333

1 mm

FIGURES 329-333. *Pison dives* Turner. (329) Female clypeus; (330) Male clypeus; (331) Upper frons of female; (332) Female head in lateral view; (333) Female gaster in dorsal view.

more than one diameter apart (Fig. 331). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $4 \times$  as long as midocellar diameter. Scutum not foveate along flange, with at most minute, short longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging about one diameter apart, interspaces microsculptured, dull. Anterior half of tegular margin straight or minimally concave, clearly contrasting with rounded posterior half. Mesopleuron dull, conspicuously microsculptured, with fine, shallow punctures that average about 2-3 diameters apart. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits; metapleural punctures micro-





FIGURES 334-338. *Pison dives* Turner, male. (334) Basal flagellomeres; (335) Apical terga; (336) Sternum VIII (ventral view); (337) Genitalia in dorsal view; (338) Genitalia in lateral view.

scopically small. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, with ill-defined punctures between ridges; side finely ridged, punctate between ridges; posterior surface irregularly ridged. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I fine, minute on basal half, more than one diameter apart. Sterna densely punctate throughout.

Setae erect on frons, postocellar area, gena, thorax, forecoxal venter, femoral venters, in many females and some males also on horizontal part of tergum I, genal setae sinuous in female, nearly straight in male, longest setae slightly longer than two midocellar diameters; tergal setae golden (Fig. 333).

Head, thorax, propodeum, and legs black; mandible and antenna black, in some females clypeal lamella and mandible mesally brown.

♀.—Upper interocular distance equal to  $0.70-0.74 \times$  lower interocular distance; ocellocular

distance equal to  $1.0\text{--}1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6\text{--}0.8$  hindocellar diameter; eye height equal to  $1.0 \times$  distance between eye notches. Clypeal lamella obtusely pointed (Fig. 329). Dorsal length of flagellomere I  $2.5\text{--}2.9 \times$  apical width, of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with minimal incision at about two thirds of length. Length  $9.0\text{--}12.5$  mm; head width  $2.6\text{--}3.0$  mm.

♂.—Upper interocular distance equal to  $0.72\text{--}0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli  $0.9\text{--}1.0 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Clypeal lamella rectangular (Fig. 330). Flagellomeres III-V concave basoventrally, convex apicoventrally (Fig. 334), only slightly so in small individuals, with glabrous tyloids that do not attain flagellomere apex. Dorsal length of flagellomere I  $2.3\text{--}2.4 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Tergum VII emarginate apically (Fig. 335). Sternum VIII unusually short, rounded apically (Fig. 336). Genitalia: Figs. 337, 338. Length  $7.5\text{--}8.0$  mm; head width  $2.2\text{--}2.5$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 339).—Eastern Australia.

**RECORDS.— AUSTRALIA: New South Wales:**

Cocumbac Island Nature Reserve near Taree (1 ♀, 1 ♂, ANIC), Lansdowne near Taree (7 ♀, 5 ♂, AMS), 3 km N Lansdowne near Taree (1 ♀, ANIC), 0.5 km SE Lansdowne near Taree (1 ♀, ANIC), Lorient Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (1 ♀, ANIC; 4 ♀, 1 ♂, AMS; 2 ♂, CAS), Manly: Kangaroo Park (1 ♀, ANIC), Mooney Mooney Creek near Gosford (1 ♀, AMS), 15 km N Wauchope at  $31^{\circ}21'S$   $152^{\circ}47'E$  (1 ♀, AMS), Wilson River Primitive Reserve 15 km NW Bellangry (1 ♀, AMS), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (3 ♀, CAS).

**Queensland:** Brisbane (1 ♀, RMNH; 3 ♀, QMB), Brookfield (3 ♀, BMNH), Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$  (67 ♀, 14 ♂, CAS; 2 ♀, USNM), Kroombit Tops State Forest (4 ♀, AMS), Kuranda (1 ♀, BMNH, lectotype of *Pison dives*), 1.5 km SE Kuranda (1 ♀, ANIC), Lake Barrine (1 ♀, QMB), Mackay (1 ♀, BMNH), Mission Beach (1 ♀, AMS), Mount Glorious at  $27^{\circ}20'S$   $152^{\circ}45'E$  (1 ♂, MNKB), Paluma Range (1 ♀, CAS).



FIGURE 339. Collecting localities of *Pison dives* Turner.

***Pison ecarinatum* Pulawski, species nova**

Figures 340-342.

**NAME DERIVATION.**—*Ecarinatum*, a Latin neuter adjective meaning *without carina*; with reference to the propodeum lacking the sublateral longitudinal carina.

**RECOGNITION.**—*Pison ecarinatum* (only the female is known) is one of the species with abundant erect setae on tergum I. It can be recognized by the following combination: the punctures of the frons are fine; the clypeal free margin has a median lobe (and is concave adjacent to the orbit); the gena is punctate and setose adjacent to the oral fossa; the scutal punctures and the mesopleural punctures (most or all) are less than one diameter apart; the propodeum has no longitudinal carina separating the side from the dorsum and posterior surface; the sterna are punctate throughout; the legs and gaster are all black; the apical depressions of terga II-V (except tergum II laterally) have golden setal fasciae. The ocellocular distance equals  $1.4\text{--}1.9 \times$  hindocellar diameter, while  $0.9\text{--}1.0$  in *P. dispar*.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Gena narrow in dorsal view (Fig. 341). Labrum shallowly emarginate, almost straight. Anteromedian





FIGURES 340-341. *Pison ecarinatum* Pulawski, sp. nov., female. (340) Clypeus and mandibles; (341) Head in dorsal view.

FIGURE 342. Collecting localities of *Pison ecarinatum* Pulawski, sp. nov.



pronotal pit round, slightly less than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures less than one diameter apart. Tegula enlarged. Mesopleural punctures larger than those on scutum, most or all less than one diameter apart. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, punctate between ridges; side punctate, interspaces merging into small, irregular ridges; posterior surface coarsely, transversely ridged (ridges evanescent in specimen from Gooburrum Shire, Queensland), punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures averaging about one diameter apart. Punctures of tergum I averaging about 1-2 diameters apart on horizontal part mesally. Sterna punctate throughout, punctures of sternum II several diameters apart mesally.

Setae silvery, erect on upper frons, thorax, forecoxal venter, femoral venters, and tergum I; those of lower gena sinuous, as long as  $2.5 \times$  midocellar diameters; largely concealing integument on clypeus. Apical depressions of terga (including tergum II) with golden setal fasciae (fascia of tergum I silvery laterally).

Body all black; mandible dark brown in apical half.

♀.— Upper interocular distance equal to  $0.76-0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.4-1.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8-1.2 \times$  hindocellar diameter; eye height equal to  $0.86-0.96 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 340). Dorsal length of flagellomere I  $2.5-2.9 \times$  apical width, of flagellomere IX  $1.4-1.7 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 8.7-11.8 mm; head width 2.9-3.7 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 342).— Northern Territory, Queensland.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Queensland: Gooburrum Shire [now Burnett Shire] near Bundaberg, 27 Oct 1973, H. Frauca (ANIC).

PARATYPES: AUSTRALIA: Northern Territory: 23 km WNW Alice Springs at 23°36'S 133°34'E, 30 Sept 1978, J.C. Cardale (1 ♀, ANIC). Queensland: Brisbane: Blunder Creek, 11 Nov 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♀, QMB); 48 km E Mount Surprise at 18°09.0'S 144°43.6'E, 21 Nov 2012, V. Ahrens and W.J. Pulawski (2 ♀, CAS).

***Pison elatum* Pulawski, species nova**

Figures 343-348.

**NAME DERIVATION.**—*Elatum* is the neuter of the perfect passive participle of the Latin verb *effero*, to bring forth, bring out; with reference to the elevated platform on male sternum VIII.

**RECOGNITION.**—The male of *Pison elatum* (the female is unknown) is characterized by an all black gaster, the presence of three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It is unique in having an elevated, triangular platform on sternum VIII (Figs. 344, 345). The free margin of the clypeal lamella concave on each side of the midpoint (Fig. 343) and the apically rounded sternum VIII (Fig. 344) are subsidiary recognition feature.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures nearly contiguous (except posteriorly). Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges fine except conspicuous near base, evanescent on most of surface in specimen from South Australia), punctate between ridges; side punctate, with interspaces merging into ridges (ridges well defined dorsally, evanescent ventrally); posterior surface transversely ridged, punctate between ridges, with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Punctures of tergum I about one diameter apart anterior to apical depression. Sterna punctate throughout, most punctures less than one diameter apart, but median, preapical punctures more than one diameter apart on sterna II-IV.

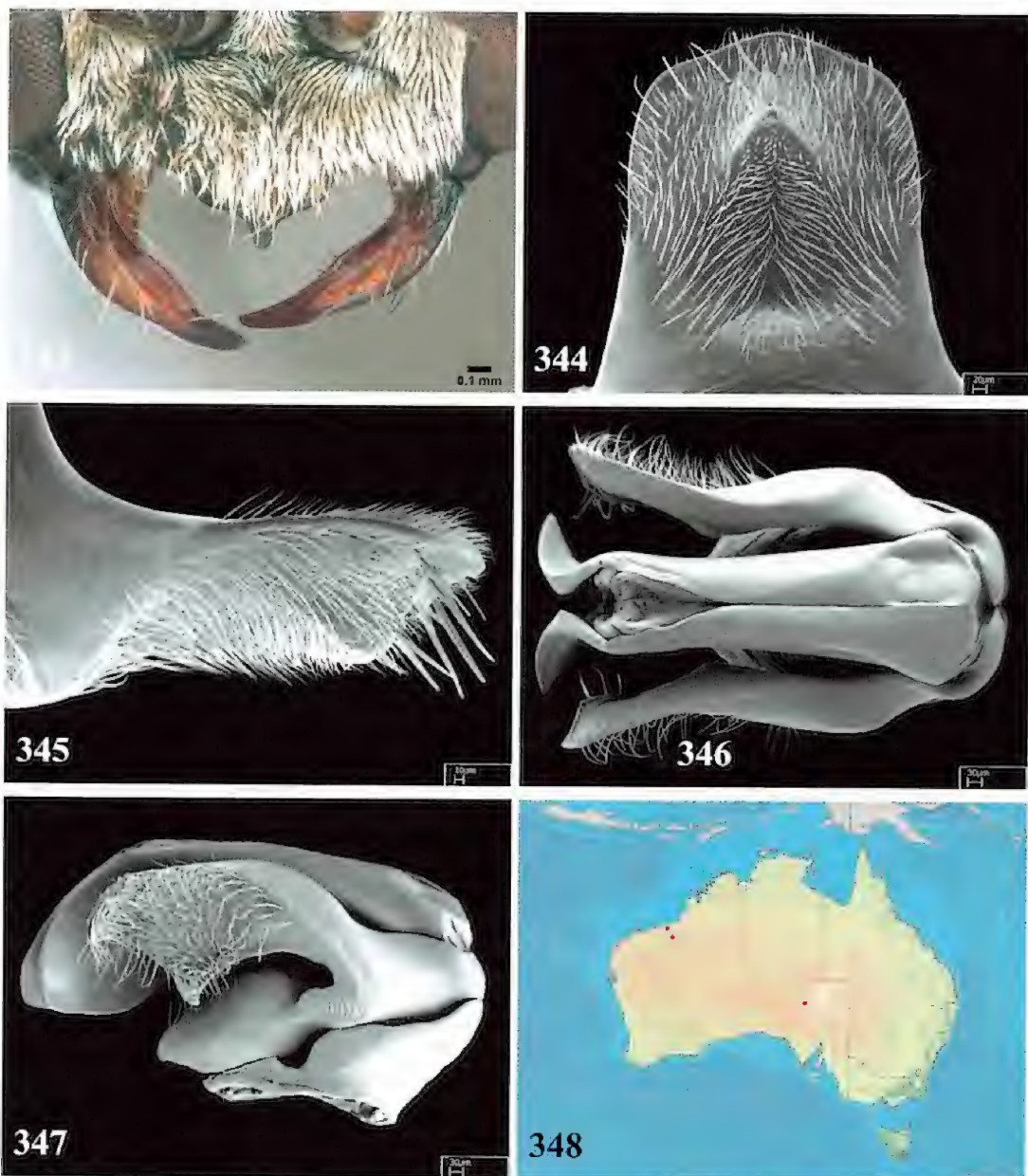
Setae silvery, appressed on postocellar area, scutum, and tergum I; on lower gena subappressed to suberect, straight (with apices curved), shorter than midocellar diameter; completely concealing integument on clypeus (except lamella). Apical depressions of terga with silvery, setal fasciae.

Body black, flagellum all black or brown ventrally, legs black in specimens from 6 km E Nilpinna and from 28 km E Leonora, fore- and midtibiae partly ferruginous and hindtibia and tarsi ferruginous in those from 47 km and 80 km S Pardoo Roadhouse (forebasitarsus dark in specimen from 104 km E Marble Bar).

♀.—Unknown.

♂.—Upper interocular distance equal to  $0.80 \times$  lower interocular distance; ocellocular distance equal to  $1.1-1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.2 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate, concave on each side of midpoint (Fig. 343). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $1.2-1.3 \times$  apical width. Sternum VIII with apical margin rounded and with median, triangular, elevated platform (Figs. 344, 345). Genitalia: Figs. 346, 347. Length 6.1-6.6 mm; head width 2.0 mm.





FIGURES 343–347. *Pison elatum* Pulawski, sp. nov., male. (343) Clypeus and mandibles; (344) Sternum VIII (ventral surface); (345) Sternum VIII in oblique lateral view; (346) Genitalia in dorsal view; (347) Genitalia in lateral view.

FIGURE 348. Collecting localities of *Pison elatum* Pulawski, sp. nov.

**GEOGRAPHIC DISTRIBUTION** (Fig. 348).— South Australia, Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: **Western Australia:** 104 km E Marble Bar at 21°19.1'S 120°40.3'E, 2-15 May 2003, M.E. Irwin and F.D. Parker (ANIC).

PARATYPES: AUSTRALIA: **South Australia:** 6 km E Nilpinna, 4-6 Mar 1975, E.G. Matthews (1 ♂, SAM). **Western Australia:** 28 km E Leonora, 18 Sept 1962, E.S. Ross and D.Q. Cavagnaro (1 ♂, CAS); 47 km S Pardoo Roadhouse on Shay Gap road at 20°22.7'S 120°01.3'E, 1-14 May 2003, M.E. Irwin and F.D. Parker (3 ♂, CAS); 80 km S Pardoo Roadhouse on Shay Gap road at 20°28.3'S 120°10.0'E, 5 Jan-14 May 2003, F.D. Parker and M.E. Irwin.

***Pison elongatum* Pulawski, species nova**

Figures 349-356.

**NAME DERIVATION.**— *Elongatum*, Latin neuter adjective for *elongate*; with reference to the body shape.

**RECOGNITION.**— *Pison elongatum* has a black gaster (apical depressions of terga III-V yellowish), three submarginal cells, second recurrent vein interstitial with second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It is one of the four species in which the ferruginous tibiae are combined with the absence of the longitudinal carina separating the side from the dorsum and posterior surface of the propodeum. It can be distinguished as follows:

Unlike *P. pilifrons*, the punctures of the upper frons are well defined in *P. elongatum*, the mesopleural punctures are less than one diameters apart near the center, and the setae of the scutum are appressed. In *P. pilifrons*, the punctures of the upper frons are microscopically small and practically unrecognizable, the mesopleural punctures average 2-3 diameters apart near the center, and the setae of the scutum are erect.

Unlike *P. emarginatum*, the frons of *P. elongatum* is not swollen above the antennal socket, the clypeal lamella of the female is rounded, nonprominent (Fig. 349), and male sternum VIII is not emarginate or slightly emarginate apically (Fig. 353). In *P. emarginatum*, the frons is swollen above the antennal socket, the clypeal lamella of the female is prominently angulate, and male sternum VIII is deeply emarginate apically (Fig. 361).

Unlike *P. aurifex*, the scutal punctures of *P. elongatum* are small but not minute, the interspaces in the female are smaller than the punctures but not linear, the wing membrane is hyaline and the veins brown, and male sternum VIII has the lateral margins subparallel, the apex truncate, shallowly emarginate, with an obtuse posterolateral corner (Fig. 353). In *P. aurifex*, the scutal punctures are minute, the interspaces in the female linear, the wing membrane is yellowish and the veins are ferruginous, and male sternum VIII is triangular, rounded apically, without a posterolateral corner (Fig. 146).

Subsidiary recognition features of *Pison elongatum* are: gaster elongate at least in female, tergum I longer than apically wide (Fig. 351), tergum II with silvery setae markedly less conspicuous on the apical depression (except for lateral setae in some specimens) than on terga I and III, and female tergum VI in most specimens rounded apically (Fig. 352).

**DESCRIPTION.**— Frons dull, with well-defined punctures that are less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well-defined, less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures well defined, larger than those on scutum, less than one diameter apart near center, but more than one diameter apart anteroventrally. Postspiracular carina present, shorter than midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posteri-



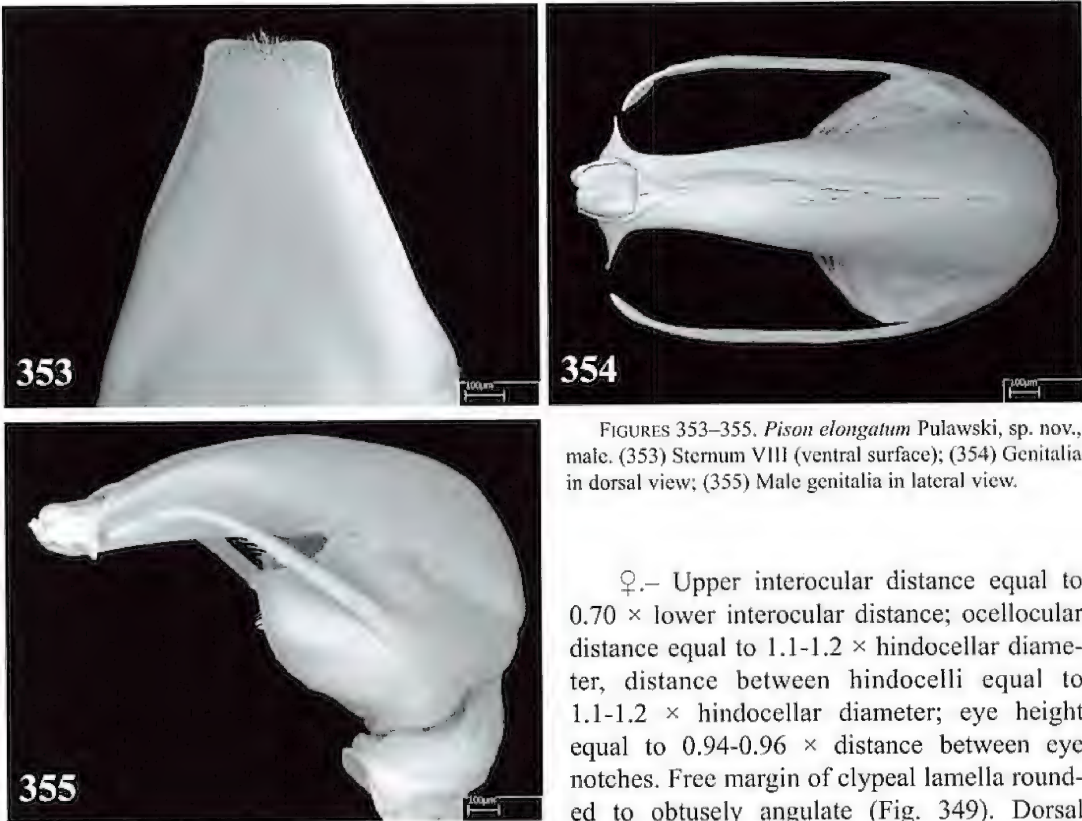


FIGURES 349–352. *Pison elongatum* Pulawski, sp. nov. (349) Female clypeus and mandibles; (350) Male clypeus and mandibles; (351) Female gaster in dorsal view; (352) Female tergum VI in dorsal view.

or surface; middle carina absent in some specimens, present only basally in others, remaining dorsum and side closely punctate, with interspaces merging into ridges; posterior surface ridged or rugose, punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures up to several diameters apart. Hindcoxal dorsum with outer margin carinate only preapically. Gaster elongate at least in female, tergum I longer than apically wide (Fig. 351). Punctures of tergum I minute, about one diameter apart on horizontal part, but relatively large and up to several diameters apart basally. Sterna punctate throughout, interspaces microareolate.

Setae silvery on head, thorax and propodeum, but golden on pronotal collar; only suberect and oriented ventrad between dorsal end of midfrontal carina and midocellus; appressed on scutum, and tergum I (except suberect and about as long as midocellar diameter on side of basal slope of tergum I in female and some males); not concealing integument on clypeus in female, completely concealing (except lamella) in male; setae of lower gena in female sinuous, about as long as  $1.5 \times$  midocellar diameter, in male straight, about as long as  $0.6 \times$  midocellar diameter. Apical depression of tergum I with ill-defined silvery or golden setal fascia, tergum II with dark brown setae on apical depression (except with silvery setae laterally in some specimens), remaining terga with golden setal fasciae on apical depressions.

Head, thorax, propodeum, and gaster black, scapal venter, pedicel, and basal flagellomeres ferruginous in some males; apical depressions of terga and tergum VI laterally brown or yellowish. Femora black, tibiae, and tarsi ferruginous.



FIGURES 353–355. *Pison elongatum* Pulawski, sp. nov., male. (353) Sternum VIII (ventral surface); (354) Genitalia in dorsal view; (355) Male genitalia in lateral view.

♀.— Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.2 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}0.96 \times$  distance between eye notches. Free margin of clypeal lamella rounded to obtusely angulate (Fig. 349). Dorsal

length of flagellomere I  $2.3\text{--}2.4 \times$  apical width, of flagellomere IX  $1.3\text{--}1.4 \times$  apical width. Mandible: trimmal carina with incision at about two thirds of length (incision varying from minute to well-defined); acetabular groove with two rows of punctures and associated setae. Tergum VI rounded apically (Fig. 352) except narrow in single female from Emerald, Queensland. Length 8.3–14.0 mm; head width 2.2–3.2 mm.

♂.— Upper interocular distance equal to  $0.80 \times$  lower interocular distance; ocellocular distance equal to  $1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 350). Dorsal length of flagellomere I  $2.0\text{--}2.2 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Sternum VIII subtriangular, apically not concave or slightly concave, almost straight, with obtusely angulate apicolateral corner (Fig. 353). Genitalia with gonocoxite modified into long, narrow filament (Figs. 354, 355). Length 7.4–10.2 mm; head width 2.0–2.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 356).— Eastern New South Wales, eastern Queensland.

**RECORDS.**— **HOLOTYPE:** ♀, AUSTRALIA: New South Wales: Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , 29 Dec 2011, V. Ahrens and W.J. Pulawski (AMS).

**PARATYPES:** AUSTRALIA: New South Wales: Burrendong Botanic Garden at  $32^{\circ}42.1'S$   $149^{\circ}06.2'E$ , 13 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , V. Ahrens and W.J. Pulawski, 28 Dec 2011 (7 ♀, CAS) and 29 Dec 2011 (9 ♀, CAS); 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$ , 10 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$ , 30 Dec 2011, V. Ahrens and W.J. Pulawski (8 ♀, CAS); 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$ , 5 Jan 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Orange Botanic Garden at  $33^{\circ}15.3'S$   $149^{\circ}05.7'E$ , 8 and 9 Dec 2009, V. Ahrens and W.J. Pulawski (2 ♀, CAS); Tallong, 19 Dec 1950, no collector (1 ♀, 1 ♂, AMS); Warrenburg National Park, 20 Dec 1987,



M.E. Irwin (9 ♀, 5 ♂, UCD); Warrumbungle National Park at 31°16.9'S 148°59.1'E, V. Ahrens and W.J. Pulawski, 16 Dec 2009 (3 ♀, CAS), 17 Dec 2009 (7 ♀, 1 ♂, CAS), 21 Dec 2009 (4 ♀, 3 ♂, CAS), 22 Dec 2009 (1 ♀, 1 ♂, CAS), 24 Dec 2009 (1 ♀, CAS); same locality, 19 Dec 1987, M.E. Irwin (2 ♀, CAS); same locality at 31°16'S 148°57'E, 17 Dec 1995, M.E. Irwin (1 ♀, 1 ♂, MNKB); Warrumbungle National Park: Camp Pincham, 10 Jan 1985, D.B. McCorquodale (1 ♂, ANIC); near Warrumbungle National Park at 31°16.9'S 149°04.8'E, V. Ahrens and W.J. Pulawski, 1 Jan 2012 (2 ♀, CAS) and 2 Jan 2012 (3 ♀, CAS); Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E, 7 Jan 2012, V. Ahrens and W.J. Pulawski (4 ♀, CAS). **Queensland:** Emerald, 31 Dec 1986, H. and A. Howden (3 ♀, ANIC); Gayndah, no date or collector (1 ♀, AMS), 5 km N Leyburn at 27°58'S 151°38'E, 2 Mar 1986, G. and A. Daniels (1 ♀, QMB); 6 km N Taroom at 25°36'S 149°46'E, 2 Oct 1992, G. Daniels (1 ♀, QMB).



FIGURE 356. Collecting localities of *Pison elongatum* Pulawski, sp. nov.

***Pison emarginatum* Pulawski, species nova**

Figures 357-364.

**NAME DERIVATION.**—*Emarginatum*, Latin neuter for *emarginate*, with reference to the markedly emarginate male sternum VIII.

**RECOGNITION.**—*Pison emarginatum* has a black gaster, three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. Also, the ferruginous tibiae are correlated with the absence of the longitudinal carina separating the propodeal side from the dorsum and posterior surface, one of four such species. Unlike the other three species with this character combination (*P. aurifex*, *P. elongatum*, and *P. pilifrons*), the frons of *P. emarginatum* is swollen just above the antennal socket (Fig. 359) rather than not swollen, the female has an angulate (rather than rounded) clypeal lamella, and male sternum VIII is deeply emarginate apically (Fig. 361) rather than truncate or rounded, narrowly emarginate mesally in *pilifrons*. The minutely punctate metapleuron (markedly finer than the mesopleuron and the adjacent part of the propodeum) is a subsidiary recognition feature. Unlike *P. pilifrons*, the punctures of the upper frons are well defined (rather than microscopically small, practically unrecognizable), the mesopleural interspaces are shiny, only slightly microsculptured (rather than dull, conspicuously microsculptured), and the setae of the scutum are appressed (rather than erect).

**DESCRIPTION.**—Frons swollen just above antennal socket (Fig. 359), dull, finely punctate, punctures less than one diameter apart. Labrum not emarginate. Pronotal collar roundly angulate laterally. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures larger than those on scutum, about one diameter apart near center (Fig. 360), up to about three diameters apart in specimen from Victoria. Postspiracular carina present, as long as or shorter than midocellar diameter. Metapleuron microscopically punctate (markedly finer than mesopleuron and adjacent part of propodeum); metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface in male from Black Mountain, Australian Capital Territory, the carina is replaced by series



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FIGURES 357-360. *Pison emarginatum* Pulawski, sp. nov. (357) Female clypeus; (358) Male clypeus; (359) Female head in lateral view; (360) Female mesopleuron.

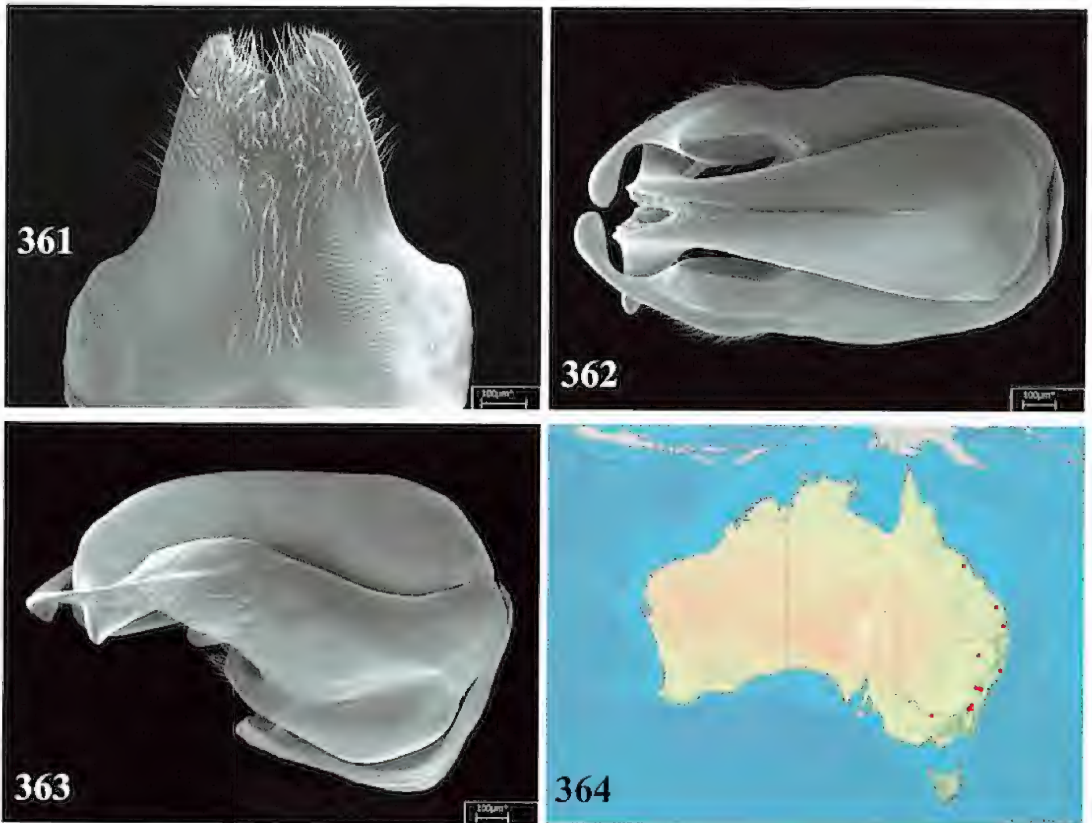
of short, transverse carinae); dorsum obliquely ridged, punctate between ridges; side punctate, minutely ridged behind spiracle; posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures 2-3 diameters apart. Hindcoxal dorsum with outer margin not carinate in anterior half. Punctures of tergum I about one diameter apart on horizontal portion, compressed just adjacent to apical depression. Sternum II punctate throughout, punctures well defined, about 2-3 diameters apart (about 1-2 diameters apart in specimen from Canberra).

Setae golden (silvery in specimens from Canberra, Victoria, and Whiskers, New South Wales), appressed on scutum and tergum I; setae of lower gena subappressed, slightly curved, about as long as midocellar diameter; largely concealing integument on clypeus in female, completely so in male. Apical depressions of terga with golden setal fasciae (but fasciae silvery in specimen from Canberra and that from Victoria).

Head, thorax, propodeum, and gaster black; antenna ferruginous, black apically (all black in specimen from Canberra and that from Victoria). Femora black basally, ferruginous apically (all black in specimen from Canberra), tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.0-1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8-1.1 \times$  hindocellar diameter; eye height equal to  $1.00-1.04 \times$  distance between eye notches. Free margin of clypeal lamella angulate (Fig. 357). Dorsal length of flagellomere I  $1.8-2.0 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Length 9.9-14.6 mm; head width 2.5-3.3 mm.





FIGURES 361-363. *Pison emarginatum* Pulawski, sp. nov., male. (361) Sternum VIII (ventral surface); (362) Genitalia in dorsal view; (363) Genitalia in lateral view.

FIGURE 364. Collecting localities of *Pison emarginatum* Pulawski, sp. nov

♂.— Upper interocular distance equal to  $0.80-0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.2-1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2 \times$  hindocellar diameter; eye height equal to  $1.00-1.08 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 358). Dorsal length of flagellomere I  $1.9 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Sternum VIII deeply emarginate apically (Fig. 361). Genitalia: Figs. 362, 363. Length 8.5-11.1 mm; head width 2.4-2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 364).— Eastern New South Wales, eastern Queensland, Victoria.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA: New South Wales:** Clarence in Blue Mountains, 28 Jan 1987, N.W. Rodd (AMS).

**PARATYPES:** **AUSTRALIA: Australian Capital Territory:** Black Mountain, 11-31 Dec 1979, D.H. Colless (1 ♂, ANIC); Farrer, southern suburb of Canberra at  $35^{\circ}22'S$   $149^{\circ}05'E$ , 1 Jan 1988, D.C.F. Rentz (1 ♀, ANIC). **New South Wales:** Lake George Cullerin, 15 Feb 1988, M.E. Irwin (4 ♂, UCD); 0.5 km SE Lansdowne near Taree, 22 Nov 1992, G. and T. Williams (1 ♀, ANIC); Mount Kaputar National Park: Euglah Springs road, 19 Jan 1978, E.I. Schlinger (1 ♂, CAS); Mount Tomah in Blue Mountains, 10 Nov 1982, 20 Nov 1982, 5 Jan 1983, and 15 Jan 1978, N.W. Rodd (4 ♂, AMS); 4 km W Sunny Corner at  $33^{\circ}22.7'S$   $149^{\circ}51.6'E$ , 10 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♂, CAS), Whiskers 7 km WNW Hoskinstown at  $35^{\circ}24'S$   $149^{\circ}23'E$ , 29 Jan 1993, M.S. Upton (1 ♀, ANIC). **Queensland:** Brisbane Forest Park at  $27^{\circ}25'S$   $152^{\circ}50'E$ , 14-29 Nov 1995, M.E. Irwin (1 ♀, MNKB), Coast Range near Biggenden, 30 Oct 1976, H. Frauca (1 ♂, ANIC); Eungella

National Park at 21°10.5'S 148°30.3'E, V. Ahrens and W.J. Pulawski, 31 Oct 2006 (1 ♂, CAS), 5 Nov 2012 (1 ♂, CAS), 7 Nov 2012 (2 ♂, CAS), 8 Nov 2012 (1 ♂, CAS), 9 Nov 2012 (1 ♀, CAS). **Victoria:** no specific locality, date, or collector (1 ♀, BMNH).

### *Pison erythrocerum* Kohl

Figures 365-372.

*Parapison ruficorne* F. Smith, 1869:300, ♀ (as *ruficornis*, incorrect original termination), junior secondary homonym of *Pison ruficorne* F. Smith, 1856. Lectotype: ♀, Australia: no specific locality (BMNH), **present designation**, examined. – Froggatt, 1892:218 (in catalog of Australian Hymenoptera).

*Pison erythrocerum* Kohl, 1885:186 (as *erythrocerus*, incorrect original termination). Substitute name for *Pison ruficorne* (F. Smith, 1869). – Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Turner, 1916b:596 (in key to Australian *Pison*), 600 (bibliographic references, male clypeus; Queensland: Kuranda, Mackay); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**– Smith (1869) did not mention the number of the specimens examined in the original description of *Pison ruficorne*. I have designated as the lectotype the only specimen present in The Natural History Museum, London labeled “*ruficornis*” and, in a different handwriting, “*erythrocerum*”.

**RECOGNITION.**– *Pison erythrocerum* has only two submarginal cells, the second of which is elongate (length of posterior margin  $1.8\text{--}1.9 \times$  height). The clypeal free margin has a well-defined median lobe with an obtuse point (Figs. 365, 366) in both sexes (concave on each side of the point), the tegula is partly unsculptured, the propodeum has a longitudinal carina separating the side from the dorsum and posterior surface and extending from the gastral socket area toward the spiracle, the length of tergum I is smaller than the apical width, the gaster is all black, and the legs and antenna (except apically) are ferruginous.

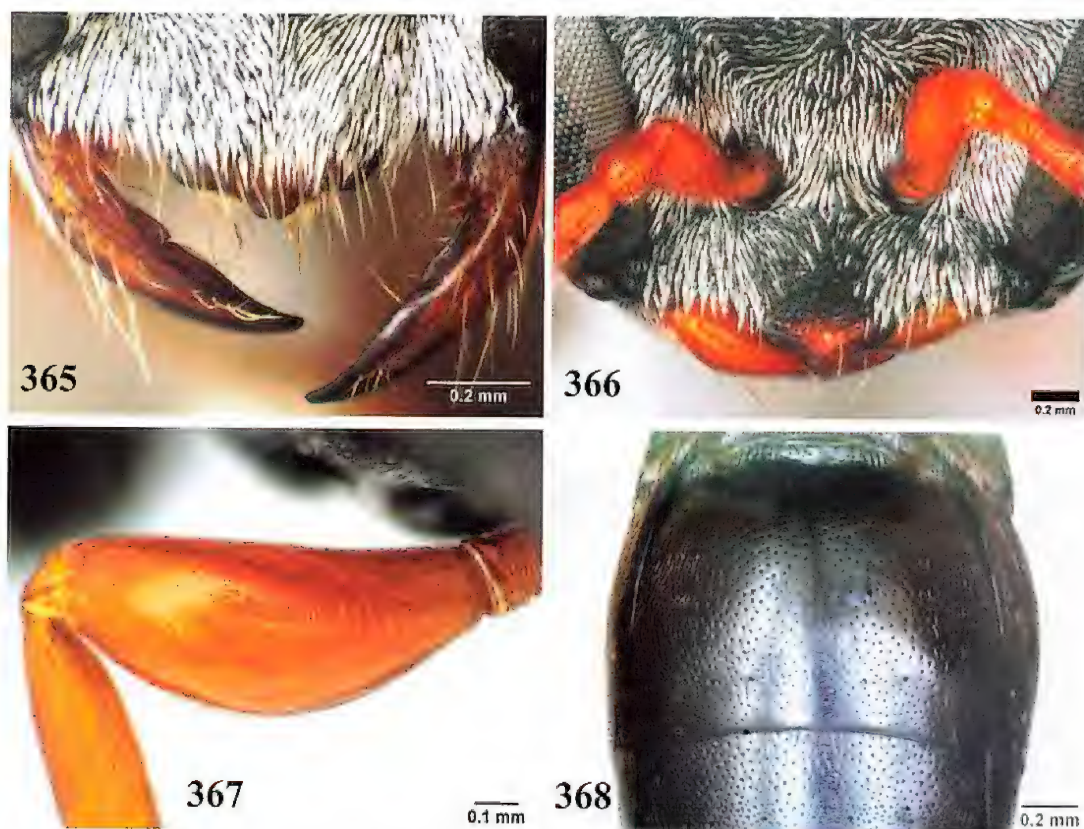
*Pison erythrocerum* is similar to *P. compressum*, *P. erythrogastrium* and *P. simulans*. Unlike *P. compressum*, the gaster of *P. erythrocerum* is all black (rather than ferruginous), only insignificantly constricted between terga I and II (rather than markedly so in the female and many males), the punctures of sternum II are fine (rather than conspicuous), and in the female the free margin of the clypeal lamella has an obtuse, lateral corner (corner absent in *P. compressum*).

Unlike *P. erythrogastrium*, the ocellocular distance in the female is equal to  $1.0\text{--}1.2 \times$  of the hindocellar diameter ( $0.4\text{--}0.8 \times$  in *P. erythrogastrium*), and the posteroventral forefemoral surface is impunctate (Fig. 367) rather than sparsely punctate; in the male, the setae of the apical sterna are erect, as long as  $0.3\text{--}0.4 \times$  midocellar diameter (rather than appressed), the apical margin of sternum VIII is convex mesally, concave submesally, and with apicolateral corner at each side (rather than rounded). Also, the gaster is all black, whereas ferruginous in many *P. erythrocerum* (all or partly so).

Unlike *P. simulans*, the dorsum of its pronotal collar is not elongate (rather than elongate), the flagellum is ferruginous except apically (rather than black dorsally and brown ventrally), the femora are all ferruginous (rather than all or largely black), and male sternum VIII is only inconspicuously emarginate apically (markedly so in *simulans*).

**DESCRIPTION.**– Frons with small, well defined punctures that are about one diameter apart; interspaces shiny or dull, unsculptured or aciculate; middle supraantennal carina absent in most specimens. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate anteriorly. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged. Mesopleur-





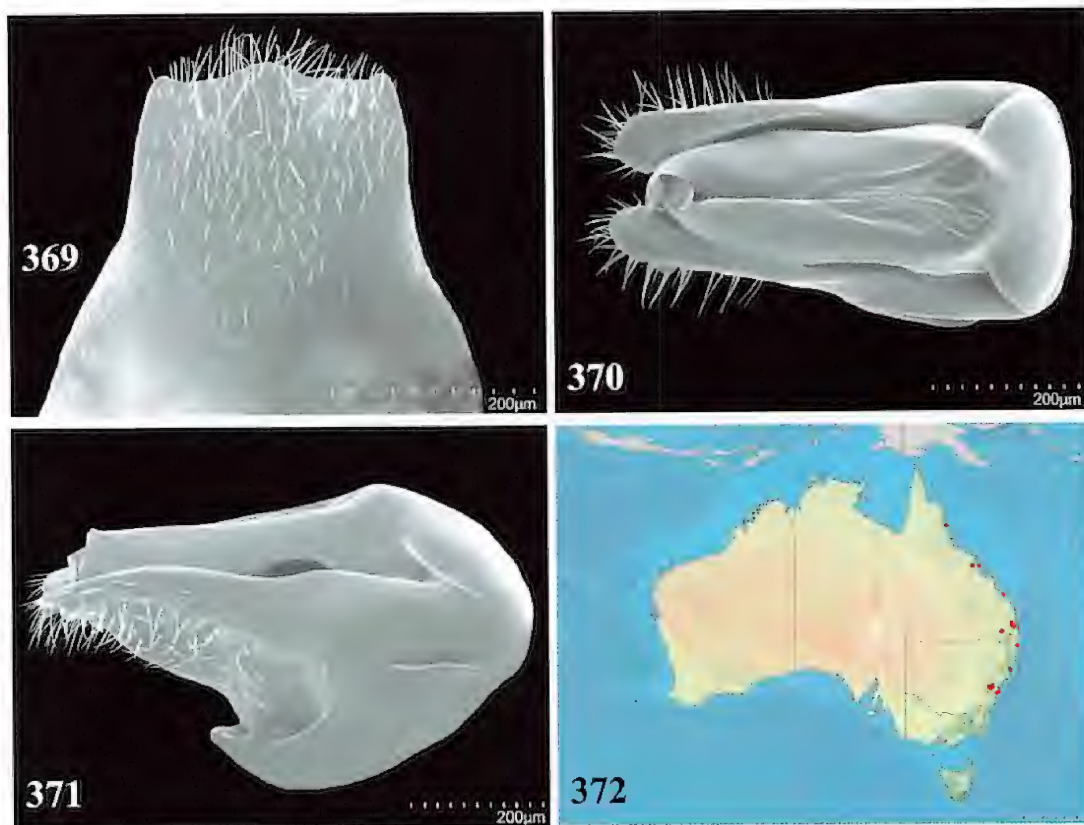
FIGURES 365-368. *Pison erythrocerum* Kohl. (365) Female clypeus and mandibles; (366) Male clypeus and mandibles; (367) Female forefemur from behind; (368) Female sternum II in ventral view.

al punctures slightly larger than those on scutum, less than one diameter apart. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges becoming less conspicuous laterally); side finely ridged anteriorly, punctate posteriorly, with interspaces merging into minute ridges; posterior surface punctate and finely, transversely ridged (ridges becoming larger toward bottom), with several conspicuous ridges radiating from transverse carina just above gastropodeal articulation. Forewing with two submarginal cells; length of posterior margin of second submarginal cell  $1.8-1.9 \times$  height. Posteroventral surface of forefemur impunctate in female, with impunctate area mesally in male. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I well defined, about one diameter apart.

Setae silvery, appressed on entire body, completely concealing integument on clypeus and lower frons. Apical depressions of terga without silvery or golden apical fasciae.

Head, thorax, propodeum, and gaster black, clypeus ferruginous next to lobe free margin in female and several males; mandible yellowish basally, ferruginous mesally, dark apically; antenna ferruginous except several apical flagellomeres dark dorsally. Femora, tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.84-0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.0-1.2 \times$  hindocellar diameter, distance between hindocelli  $1.1-1.3 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella with obtuse median point and obtuse, lateral corner (Fig. 365). Dorsal length of flagellomere I



FIGURES 369-371. *Pison erythrocerum* Kohl, male. (369) Sternum VIII (ventral surface); (370) Genitalia in dorsal view; (371) Genitalia in lateral view.

FIGURE 372. Collecting localities of *Pison erythrocerum* Kohl.

1.2-1.3  $\times$  apical width, of flagellomere IX 1.1-1.2  $\times$  apical width. Mandible: trimmal carina with minute incision at about half length. Posteroventral forefemoral surface impunctate (Fig. 367). Punctures of sternum II more than one diameter mesally (Fig. 368). Length 7.1-9.0 mm; head width 1.8-1.9 mm.

♂.— Upper interocular distance equal to 0.92-0.98  $\times$  lower interocular distance; ocellocular distance equal to 1.4  $\times$  hindocellar diameter, distance between hindocelli 1.4-1.7  $\times$  hindocellar diameter; eye height equal to 1.04  $\times$  distance between eye notches. Free margin of clypeal lamella concave on each side of midpoint (Fig. 366). Dorsal length of flagellomere I 1.2-1.4  $\times$  apical width, of flagellomere X 0.8-1.0  $\times$  apical width. Sternum VIII shallowly, broadly emarginate (Fig. 369). Genitalia: Figs. 370, 371. Length 5.3-5.8 mm; head width 1.5-1.7 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 372).— Eastern New South Wales, eastern Queensland.

**RECORDS.**— **AUSTRALIA: New South Wales:** 6 km NE Bilpin (1 ♀, 1 ♂, AMS), Clarence (1 ♂, AMS), upper Colo River Valley (1 ♀, AMS), Iluka National Park (1 ♀, AMS), Lorient Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (1 ♀, AMS), Lugarno (1 ♂, AMS), Mount Tomah (2 ♀, AMS), Woolahra (1 ♂, AMS). **Queensland:** Agnes Water 40 km E Miriam Vale (1 ♀, 2 ♂, AMS), Brisbane (1 ♀, BMNH), Brisbane Forest Park at 27°25'S 152°50'E (4 ♀, MNKB), Crediton State Forest at 21°11.8'S 148°29.9'E (1 ♀, CAS), Eungella National Park at 21°10.5'S 148°30.3'E (17 ♀, 2 ♂, CAS; 2 ♀, QMB), Kuranda (Turner, 1916a), 5 km NE Leyburn (1 ♀, CAS), Mackay (2 ♀, BMNH), Mount Pleasant (1 ♂, QMB). **No specific locality:** 1 ♀, lectotype of *Parapison ruficorne* F. Smith (BMNH).



*Pison erythrogastrum* Rohwer

Figures 373-379.

*Pison erythrogastrum* Rohwer, 1915:247, ♀. Holotype: ♀, Australia: Queensland: Duaringa in Dawson District (USNM), examined. — Turner, 1916b:595 (in key to Australian *Pison*), 599 (recognition characters); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**RECOGNITION.**— *Pison erythrogastrum* has only two submarginal cells, the length of the posterior margin of the second one being  $1.6-2.0 \times$  its height. The clypeal lobe is well differentiated (the clypeal free margin markedly concave laterally), with an obtuse median point, slightly concave on each side of the point (Fig. 373), the tegula is impunctate posterolaterally, the propodeal dorsum is separated from the side by a conspicuous, longitudinal carina that extends from the gastral socket area toward the spiracle, the length of tergum I is smaller than the apical width, and the femora (at least the hindfemur), tibiae, and tarsi are ferruginous. The female is similar to *P. compressum*, *P. erythrocerum*, and *P. simulans*, and most specimens differ from the latter two species in having a ferruginous gaster (rather than all black), although in some specimens the gaster is also black. It differs from these species as follows:

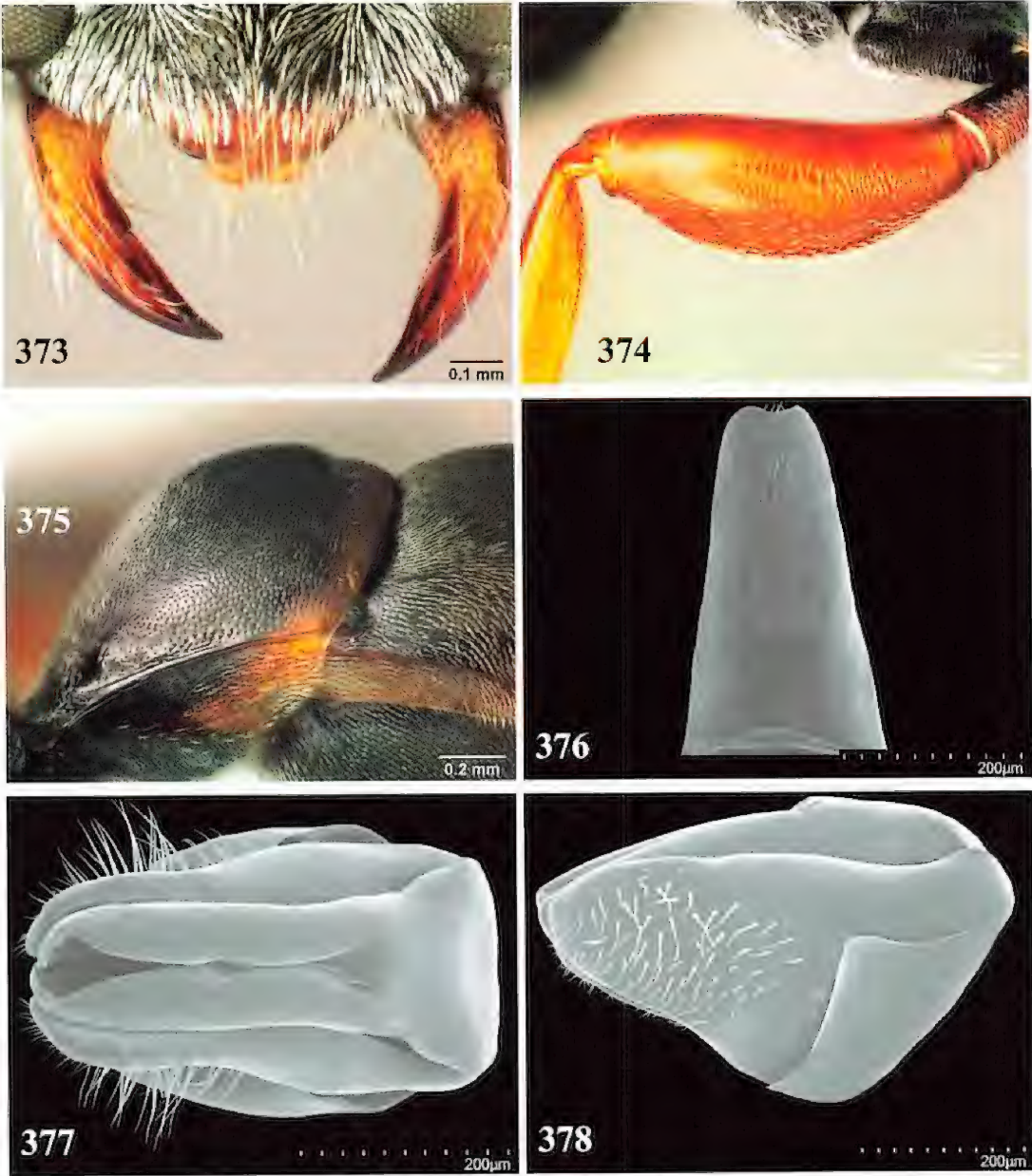
In contrast to *P. compressum*, *Pison erythrogastrum* has markedly finer punctures of sternum II, the gaster only insignificantly constricted between terga I and II (Fig. 375) rather than markedly so in the female and many males, in the female by having an obtuse, lateral corner at the free margin of the clypeal lamella (Fig. 373), and in the male by having the apical margin of sternum VIII rounded (Fig. 376) rather than shallowly emarginate.

Unlike *P. erythrocerum*, the posteroventral forefemoral surface is sparsely punctate (Fig. 374) rather than impunctate, the ocellocular distance in the female is equal to  $0.4-0.8 \times$  of the hindocellar diameter ( $1.0-1.2 \times$  in *P. erythrocerum*), in the male the setae of the apical sterna are appressed (rather than erect, as long as  $0.3-0.4 \times$  midocellar diameter), and the apical margin of sternum VIII is rounded (rather than convex mesally, concave submesally, and with apicolateral corner at each side). Also, in many specimens the gaster is ferruginous (at least partly so), whereas all black in *P. erythrocerum*.

Unlike *P. simulans*, the femora of *P. erythrogastrum* are all or largely ferruginous (rather than black except apically), and in many specimens the gaster is ferruginous, all or partly (rather than all black). In the female, the ocellocular distance is  $0.4-0.8 \times$  hindocellar diameter (rather than  $1.0-1.3 \times$  diameter), the forefemur is not swollen (rather than swollen), and the body length is 5.7-7.4 mm (rather than 7.5-8.9 mm). In the male, the apical margin of sternum VIII is rounded (rather than broadly, shallowly emarginate, and the body length is 4.7 mm (rather than 6.2-7.0 mm). The pronotal collar in many specimens is shorter than in *P. simulans*, but equally long in some.

The male can be recognized, in addition to the characters listed above, by an unusually narrow and insignificantly emarginate apically sternum VIII.

**DESCRIPTION.**— Frons minutely punctate, punctures less than one diameter apart, interspaces microsculptured but slightly shiny. Midocellus smaller than hindocellus. Labrum emarginate mesally. Anteromedian pronotal pit either round, with width equal to  $0.5$  midocellar diameter, or transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate anteriorly (punctures several diameters apart). Scutum not foveate along flange, in female with ill-defined, short longitudinal ridges adjacent to posterior margin; scutal punctures less than one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged, impunctate posterolaterally. Mesopleural punctures well defined, larger than those on scutum, less than one diameter apart. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral



FIGURES 373-378. *Pison erythrogastrum* Rohwer, female. (373) Clypeus; (374) Forefemur in posterior view; (375) Gas-tral base in profile; male: (376) Sternum VIII (ventral surface); (377) Genitalia in dorsal view; (378) Genitalia in lateral view.



metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges minute to fine except coarse near base), punctate between ridges; side punctate, partly ridged; posterior surface punctate, interspaces merging into transverse ridges. Forewing with two submarginal cells; posterior margin of second submarginal cell  $1.6\text{--}2.0 \times$  its height. Posteroventral forefemoral surface with punctures that are many diameters apart. Punctures of tergum I minute, about one diameter apart. Sternum II with well-defined punctures that average about two diameters apart mesally.

Setae silvery, appressed on gena, thorax, forecoxal venter, femoral venters, and tergum I. Apical depressions of terga without silvery or golden apical fasciae.

Head, thorax, and propodeum black, female clypeus ferruginous next to lobe free margin; mandible ferruginous except basally and apically; antenna ferruginous, one or a few apical flagellomeres dark brown dorsally. Femora, tibiae, and tarsi ferruginous. Gaster all ferruginous (most specimens) or basal segments black, all gaster black in some specimens.

♀.—Upper interocular distance equal to  $0.82\text{--}0.84 \times$  lower interocular distance; ocellocular distance equal to  $0.4\text{--}0.8 \times$  hindocellar diameter, distance between hindocelli  $1.1 \times$  hindocellar diameter; eye height equal to  $1.12\text{--}1.14 \times$  distance between eye notches. Free margin of clypeal lamella roundly, obtusely angulate, with obtuse apical point, slightly concave on each side of point, with obtuse lateral corner (Fig. 373). Dorsal length of flagellomere I  $1.4 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width. Mandible: trimmal carina with minute incision at about midlength. Length  $5.7\text{--}7.4$  mm; head width  $1.5\text{--}1.7$  mm.

♂.—Upper interocular distance equal to  $0.90 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella pointed mesally. Dorsal length of flagellomere I  $1.0\text{--}1.1 \times$  apical width, of flagellomere X  $0.8 \times$  apical width. Apical sterna with appressed setae, sternum VIII insignificantly emarginate apically (Fig. 376). Genitalia: Figs. 377, 378. Length  $4.7$  mm; head width  $1.3\text{--}1.4$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 379).—Eastern New South Wales, eastern Queensland, western part of Western Australia.

**RECORDS.**—**AUSTRALIA:** **New South Wales:** Iluka (1 ♂, CAS), Lake George Cullerin (1 ♀, UCD), Manly: Kangaroo Park (2 ♀, ANIC),  $40.5$  km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$  (1 ♀, CAS), Pearl Beach (1 ♀, ANIC),  $15$  km NE Ulan (1 ♀, ANIC), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (5 ♀, CAS), Wiskers  $7$  km WNW Hoskinstown at  $35^{\circ}24'S$   $149^{\circ}23'E$  (1 ♀, ANIC), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (6 ♀, CAS). **Queensland:** Bamaga (1 ♀, ANIC), Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$  (1 ♀, ANIC), Curtain Fig  $2$  km SSW Yungaburra at  $17^{\circ}17'S$   $145^{\circ}34'E$  (1 ♀, ANIC), Duaringa in Dawson District (1 ♀, USNM, holotype of *Pison erythrogastrum*), Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$  (4 ♀, CAS), Halliday Bay  $50$  km NE Mackay (1 ♂, AMS),  $14$  km NW Hope Vale Mission (1 ♀, ANIC), Mackay (3 ♀, BMNH, including one paralectotype of *Pison pertinax*), Mount Molloy (1 ♀, ANIC). **Western Australia:** Kalamunda (Turner, 1916b).



FIGURE 379. Collecting localities of *Pison erythrogastrum* Rohwer.

***Pison eurygnathos* Pulawski, species nova**

Figures 380-387.

*Pison* undescribed species: Pulawski, 2017:3.

**NAME DERIVATION.**— *Eurygnathos* is derived from two Greek words: *εὐρύς*, broad, and *γνάθος*, a mandible; with reference to the unusually broad mandible of this species; a noun in apposition to the generic name.

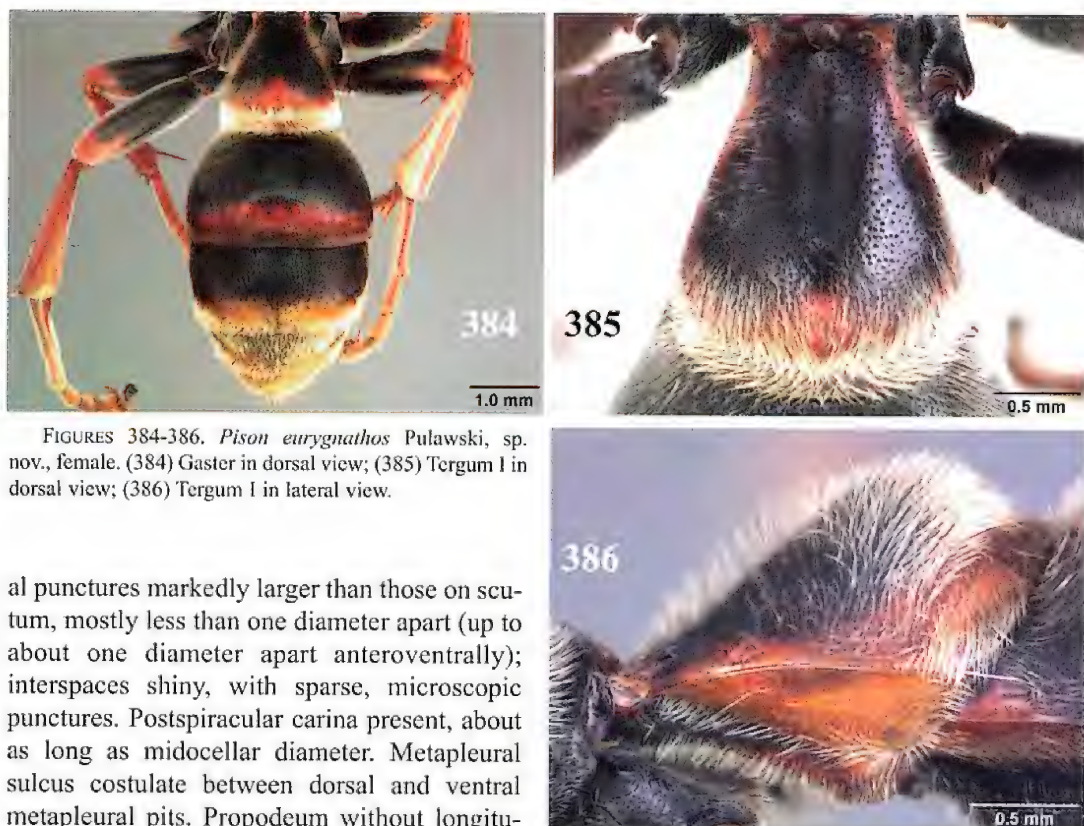
**RECOGNITION.**— *Pison eurygnathos* has erect setae on tergum I (Fig. 386). Unlike all other such species, its tergum I is elongate (Fig. 385, length about  $1.2 \times$  apical width), separated by a constriction from tergum II, and much narrower (Fig. 384) than the latter (maximum width of tergum I equal to about 0.6-0.7 of that of tergum II). The female has a mandible unique in the genus: with the inner portion broadly expanded preapically and with two conspicuous, rounded preapical teeth (Fig. 381), without acetabular groove and with a shallow, broadened condylar groove, with a conspicuous, sharp acetabular carina. The male is unknown.

**DESCRIPTION.**— Frons dull, finely punctate, punctures nearly contiguous. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit slightly transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, no more than one diameter apart (many of them contiguous). Tegula enlarged, minutely punctate throughout (Fig. 382). Mesopleur-



FIGURES 380-383. *Pison eurygnathos* Pulawski, sp. nov., female. (380) Clypeus and mandibles; (381) Mandible (arrow shows acetabular carina); (382) Tegula and adjacent scutum; (383) Propodeum in dorsal view.





FIGURES 384-386. *Pison eurygnathos* Pulawski, sp. nov., female. (384) Gaster in dorsal view; (385) Tergum I in dorsal view; (386) Tergum I in lateral view.

al punctures markedly larger than those on scutum, mostly less than one diameter apart (up to about one diameter apart anteroventrally); interspaces shiny, with sparse, microscopic punctures. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (Fig. 383), also with minute oblique ridges at least basolaterally; side punctate, punctures less than one diameter apart; posterior surface punctate, also finely, transversely ridged in ventral half. Tergum I slightly elongate: length about  $1.1-1.2 \times$  apical width (Fig. 385), separated by constriction from tergum II (Fig. 386); punctures about 1-2 diameters apart on horizontal part. Sternum II punctate throughout, punctures several diameters apart mesally.

Setae pale golden, erect on upper frons, scutum, and tergum I (Fig. 386); on lower gena erect, sinuous, up to two midocellar diameters long; not concealing integument on clypeus. Apical depressions of terga with setal fasciae, but fascia inconspicuous on tergum II (Fig. 384).

Head, thorax, propodeum, and gaster black, antenna ferruginous (two or three apical flagellomeres black), terga I and II with ferruginous preapical spot. Femora black except apically, tibiae, and tarsi ferruginous.

♀.— Upper interocular distance equal to  $0.62-0.64 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeus angulate mesally, lamella absent (Fig. 380). Dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere IX  $1.2-1.3 \times$  apical width. Mandibular inner margin broadly expanded preapically (Fig. 381), with two conspicuous, preapical teeth (basal one obtusely rounded, apical one subrectangular); acetabular groove absent, condylar groove shallow, broad; acetabular carina sharp, conspicuous. Length 11.1-12.5 mm; head width 3.1-3.2 mm.

♂.— Unknown.

**RELATIONSHIP TO *AULACOPHILINUS*.**— *Pison eurygnathos* resembles *Aulacophilinus* in two characters: the clypeal lamella is absent and the mandibular inner portion is broadly expanded preapically (Fig. 381). It differs from *Aulacophilinus* by a number of characters: the mandible is impunctate and asetose on the inner surface and has two conspicuous, preapical teeth, the condylar groove is shallow, broadened, and the acetabular carina is sharp, conspicuous. Also, the setae of tergum, I are erect, whereas appressed in *Aulacophilinus*.

**GEOGRAPHIC DISTRIBUTION** (Fig. 387).— Southeastern New South Wales, northeastern Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: New South Wales: Taree: Cooembac Island Nature Reserve, 1-8 Dec 1994, G. and T. Williams (ANIC).

PARATYPES: AUSTRALIA: New South Wales: same data as holotype except 10-21 Nov 1994 (1 ♀, CAS). Queensland: Lamington National Park at 28.216°S 153.152°E, rainforest, 31 Jan 2007, B. Morris and Sinclair (1 ♀, QMB); same locality, Jan 2007, Becky Morris (1 ♀, CAS).



FIGURE 387. Collecting localities of *Pison eurygnathos* Pulawski, sp. nov.

***Pison excisum* Pulawski, species nova**

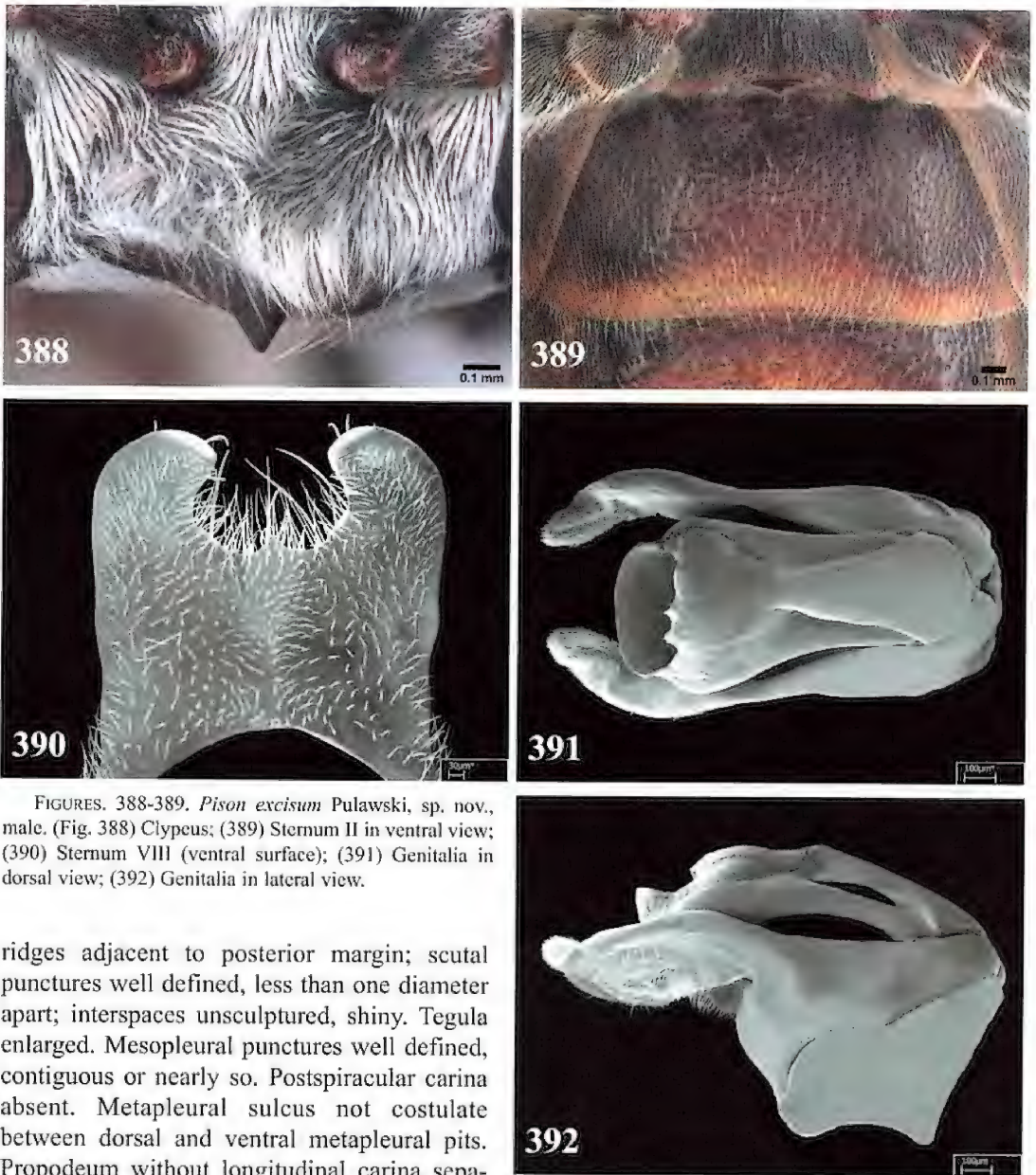
Figures 388-393.

**NAME DERIVATION.**— *Excisum*, the perfect passive participle (gender: neuter) of the Latin verb *excidere*, to cut out; with reference to the deeply cut out apical margin of male sternum VIII.

**RECOGNITION.**— Only the male of this species is known. It is characterized by an all black body, the presence of three submarginal cells, the second recurrent vein joining the third submarginal cell near its base, and setae appressed on tergum I. It differs from all other *Pison* in having a unique sternum VIII, which is unusually deeply emarginate, with the margins of the emargination converging toward the apex, hence the emargination is the broadest near the middle of its length (Fig. 390). Sternum VIII is also unusually deeply emarginate in *P. perplexum* and in *P. petraeum*, from which *P. excisum* differs by a number of characters. In *P. excisum*, the dorsal length of flagellomere I is  $2.1 \times$  apical width ( $3.3 \times$  apical width in *P. perplexum*), the flagellomeres have no tyloids (tyloids present on flagellomeres II-V in *perplexum*), the ocellocular distance is equal to  $1.0 \times$  hindocellar diameter and is smaller than the distance between the hindocelli (in *P. perplexum*, it is equal to  $1.6 \times$  hindocellar diameter and is larger than the distance between the hindocelli), the sternal punctures, particularly on the preapical sterna, are conspicuous, whereas they are moderately large in *P. perplexum*, the apical margin of sternum VII is conspicuously concave (practically straight in *P. perplexum*), and sternum VIII at apex is not bent ventrally (conspicuously bent ventrally in *P. perplexum*). Unlike *P. petraeum*, the ocellocular distance of *P. excisum* is  $1.0 \times$  mid-ocellar diameter (rather than  $1.4\text{--}1.6 \times$ ) and is smaller than the distance between the hindocelli (rather than larger), the setae of the lower gena are sinuous (rather than straight or with curved apex), the propodeum has no longitudinal carina between the spiracle and the gastral insertion (carina present in *P. petraeum*), and the margins of the emargination on sternum VIII are converging toward the apex (rather than diverging).

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart; interspaces dull, microsculptured. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal





FIGURES. 388-389. *Pison excisum* Pulawski, sp. nov., male. (Fig. 388) Clypeus; (389) Sternum II in ventral view; (390) Sternum VIII (ventral surface); (391) Genitalia in dorsal view; (392) Genitalia in lateral view.

ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart; interspaces unsculptured, shiny. Tegula enlarged. Mesopleural punctures well defined, contiguous or nearly so. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum irregularly, obliquely ridged, punctate between ridges; side densely punctate, interspaces merging into irregular ridges; posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface with fine but well defined punctures less than one diameter apart. Punctures of tergum I, anterior of apical depression, well defined, about one diameter apart. Sterna punctate throughout, punctures conspicuous, on sternum II about 1-2 diameters apart mesally (Fig. 389).

Setae silvery, subappressed on postocellar area and scutum, appressed on tergum I; on lower gena suberect, straight, curved apically, about as long as  $1.2 \times$  midocellar diameter; completely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 388). Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII conspicuously, deeply emarginate, with side of emargination concave, hence emargination broadest in middle (Fig. 390). Genitalia: Figs. 391, 392. Length 11.3 mm; head width 2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 393).— Known from one locality in Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: **Western Australia:** Juna Downs Station at  $22^{\circ}51.30'S$   $118^{\circ}40.14'E$ , 3–8 Jan 2006, CVA [= Conservation Volunteers Australia] (AMS).



FIGURE 393. Collecting locality of *Pison excisum* Pulawski, sp. nov.

### *Pison exclusum* Turner

Figures 394–403.

*Pison exclusum* Turner, 1916a:127, ♂. Lectotype: ♂, Australia: Queensland: Brisbane (BMNH), **present designation**, examined. — Turner, 1916b:596 (in key to Australian *Pison*), 601 (recognition characters, Australia: Victoria: Horsham); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Turner did not indicate the number of specimens examined in his original publication. I have designated as the lectotype of *Pison exclusum* the only specimen so labeled in The Natural History Museum, London. The specimen is from Brisbane, the type locality, and bears a label “*Pison* (*Parapison*) *exclusum* Turner. Type”

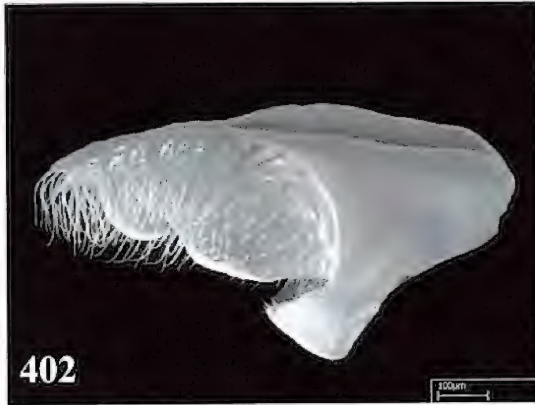
**RECOGNITION.**— *Pison exclusum* has a finely punctate throughout tegula and only two submarginal cells, the second one elongate (the posterior margin equals  $1.9\text{--}2.2 \times$  its height). Furthermore, the ocellocular distance is  $1.8\text{--}1.9 \times$  hindocellar diameter, the tarsi are shortened (foretarsomere II as long as  $1.1 \times$  apical width in female,  $1.0 \times$  in male; foretarsomere III wider than long), the clypeal lamella is tripartite (Figs. 394, 395), as in the female of *Pison virosum*, and punctures on the frons and scutum are excessively fine, conspicuously finer than mesopleural punctures. Additionally, the midtibial spur almost reaches the apex of the midbasitarsus.

**DESCRIPTION.**— Head subspherical in dorsal view (Fig. 396). Frons swollen mesally, concave dorsolaterad of antennal socket, dull, with excessively fine punctate (punctures less than one diameter apart). Labrum shallowly emarginate in female, not emarginate in male. Anteromedian pronotal pit oval, about as long as midocellar diameter. Pronotal collar swollen. Scutum finely foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures excessively fine, less than one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged, finely punctate throughout, fully concealing humeral plate or nearly so (Fig. 397). Mesopleural punctures well defined, slightly irregular, less than one diameter apart (a few punctures may be about one diameter apart). Postspiracular carina evanescent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separat-





FIGURES 394-399. *Pison exclusum* Turner. (394) Female clypeus and mandibles; (395) Male clypeus and mandibles; (396) Female head in dorsal view; (397) Female tegula and adjacent scutum; (398) Female foretarsus; (399) Female tergum VI in dorsal view.



FIGURES 400-402. *Pison exclusum* Turner, male. (400) Sternum VIII (ventral surface); (401) Genitalia in dorsal view; (402) Genitalia in lateral view.

ing side from dorsum and posterior surface and extending from gastral socket area toward spiracle, with short, transverse ridges emerging from its admedian side; dorsum closely punctate (interspaces merging into minute ridges), conspicuously rugose posterolaterally; side slightly concave, closely punctate, with interspaces merging into fine ridges, with several large ridges next to posterior margin; posterior

surface rugose, ridged laterally, or all ridged. Forewing with two submarginal cells; posterior margin of second submarginal cell  $1.9-2.2 \times$  its height. Tarsi short, foretarsomere II as long as  $1.1 \times$  apical width in female,  $1.0 \times$  in male, foretarsomere III wider than long (Fig. 398), midtarsomere III  $1.6 \times$  as long as wide apically. Midtibial spur almost reaching apex of midbasitarsus. Punctures of tergum I minute, less than one diameter apart. Sterna punctate throughout, minutely so in female.

Setae golden on head, thorax, and propodeum, appressed on gena, thorax, forecoxal venter, femoral venters, and tergum I; in specimens with black gaster conspicuous, golden on apical depressions of terga I and III, but contrastingly black on tergum II; in specimens with ferruginous gaster, all golden or (specimens from 48 km E Mount Surprise) apical fascia of tergum I silvery.

Head, thorax, and propodeum black, but the following are ferruginous: mandible in basal half, scape (with black spot dorsally), pedicel, two or three basal flagellomeres, pronotal lobe posteriorly, tegula, and humeral plate. Femora black except apically, tibiae ferruginous, partly infumate, tarsi ferruginous. Gaster black in most specimens (apical depressions of gastral segments and apical segment ferruginous or yellowish brown except tergum II practically all black), but all ferruginous in those from Northern Queensland (Mareeba area, 48 km E Mount Surprise, Rokeby area, and Split Rock).

♀.—Upper interocular distance equal to  $1.04-1.08 \times$  lower interocular distance; ocellocular distance equal to  $1.7-1.8 \times$  hindocellar diameter, distance between hindocelli  $1.9-2.3 \times$  hindocellar diameter; eye height equal to  $1.0 \times$  distance between eye notches. Free margin of clypeal lamella obtusely tridentate (Fig. 394). Dorsal length of flagellomere I  $1.3-1.5 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Mandible: trimmal carina incised slightly beyond midlength. Tergum VI rounded apically (Fig. 399). Length 8.3-8.6 mm; head width 2.4 mm.



♂.—Upper interocular distance equal to  $1.06 \times$  lower interocular distance; ocellocular distance equal to  $1.8\text{--}1.9 \times$  hindocellar diameter, distance between hindocelli  $1.8\text{--}2.4 \times$  hindocellar diameter; eye height equal to  $1.02 \times$  distance between eye notches. Free margin of clypeal lamella tripartite, middle section widest, arcuate, lateral section rounded (Fig. 395). Dorsal length of flagellomere I  $1.3 \times$  apical width, of flagellomere X  $0.9 \times$  apical width. Sternum VIII punctate throughout, rounded apically (Fig. 400). Genitalia: Figs. 401, 402. Length 7.2–8.8 mm; head width 2.1–2.6 mm.

**PREY.**—A female from Victoria was taken as she was capturing spiders on orange trees (Turner, 1916b).

**GEOGRAPHIC DISTRIBUTION** (Fig. 403).—Queensland to Victoria and South Australia.

**RECORDS.**—**AUSTRALIA:** **Australian Capital Territory:** Black Mountain (1 ♀, UCD). **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (6 ♀, CAS), 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (2 ♀, 1 ♂, CAS), Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$  (2 ♀, 2 ♂, CAS), near Warrumbungle National Park at  $31^{\circ}16.9'S$   $149^{\circ}04.8'E$  (5 ♀, CAS).

**Queensland:** Brisbane (1 ♂, BMNH, lectotype of *Pison exclusum*; 1 ♀, 1 ♂, QMB), Brisbane: Blunder Creek (1 ♀, QMB), 48 km E Mount Surprise at  $18^{\circ}09.0'S$   $144^{\circ}43.6'E$  (8 ♀, CAS), 2 km N Rokeby at  $13^{\circ}39'S$   $142^{\circ}40'E$  (3 ♀, 1 ♂, ANIC), Southedge 11 km NW Mareeba (1 ♀, ANIC), Split Rock 14 km

SE Laura at  $15^{\circ}39'S$   $144^{\circ}42'E$  (1 ♀, ANIC). **South Australia:** Arkaroola Homestead (1 ♂, SAM), Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$  (1 ♀, CAS), 3 km ENE Wilpena at  $31^{\circ}31.0'S$   $138^{\circ}36.6'E$  (4 ♀, 2 ♂, CAS). **Victoria:** Ararat (1 ♀, QMB), Horsham (2 ♀, AMS), Timboon (2 ♀, 1 ♂, QMB).



FIGURE 403. Collecting localities of *Pison exclusum* Turner.

### *Pison exultans* Turner

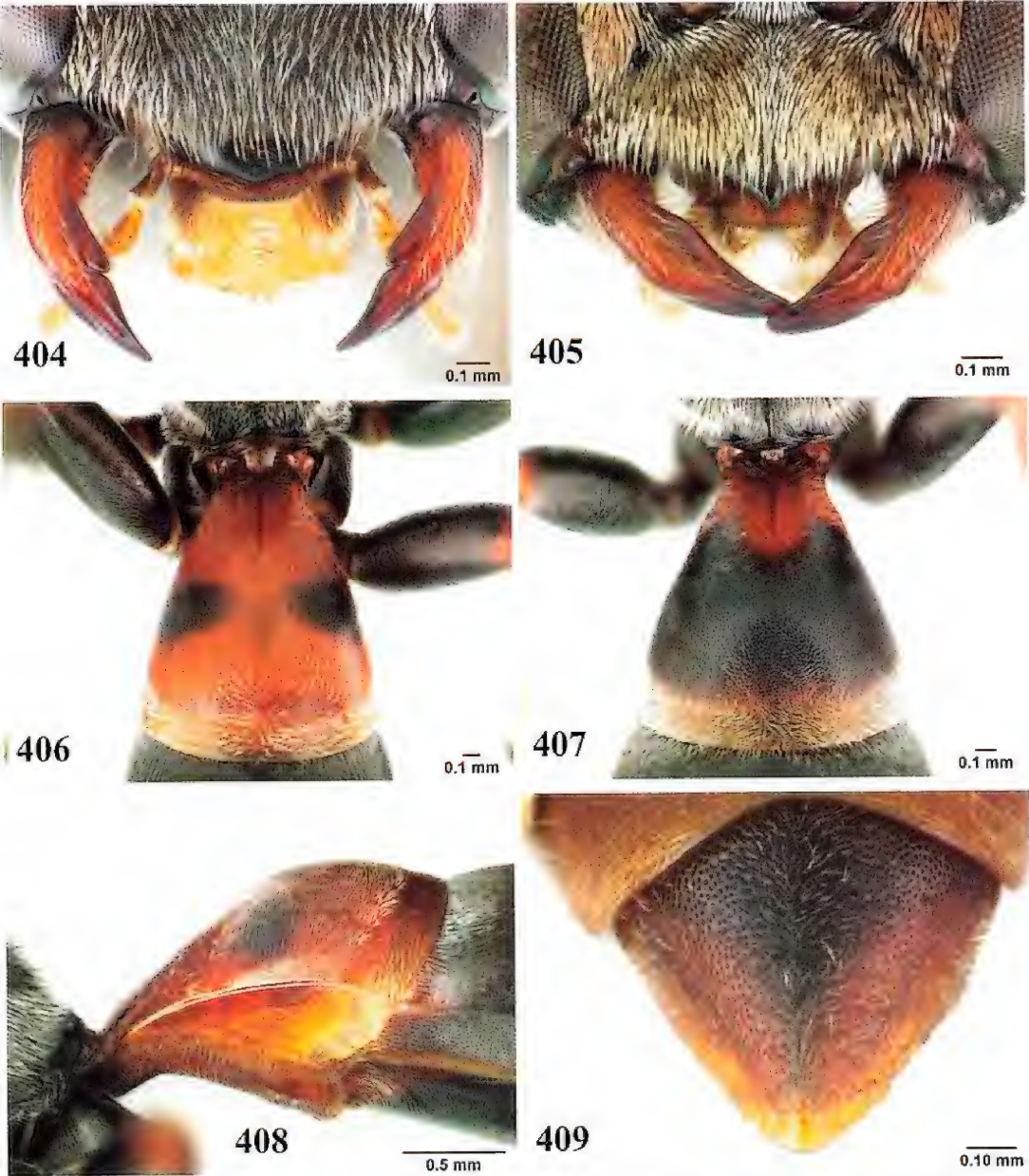
Figures 404–413.

*Pison exultans* Turner, 1916b:615, ♂. Lectotype: ♂, Australia: Victoria: no specific locality (BMNH), **present designation**, examined. — Turner, 1916b:599 (in key to Australian *Pison*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—Turner (1916b), in the original description of *Pison exultans*, did not indicate the number of specimens examined. I have selected as the lectotype of this species the only specimen in The Natural History Museum, London, a male originating from Victoria, with no specific locality, and bearing a label "*Pison exultans* Turn. Type".

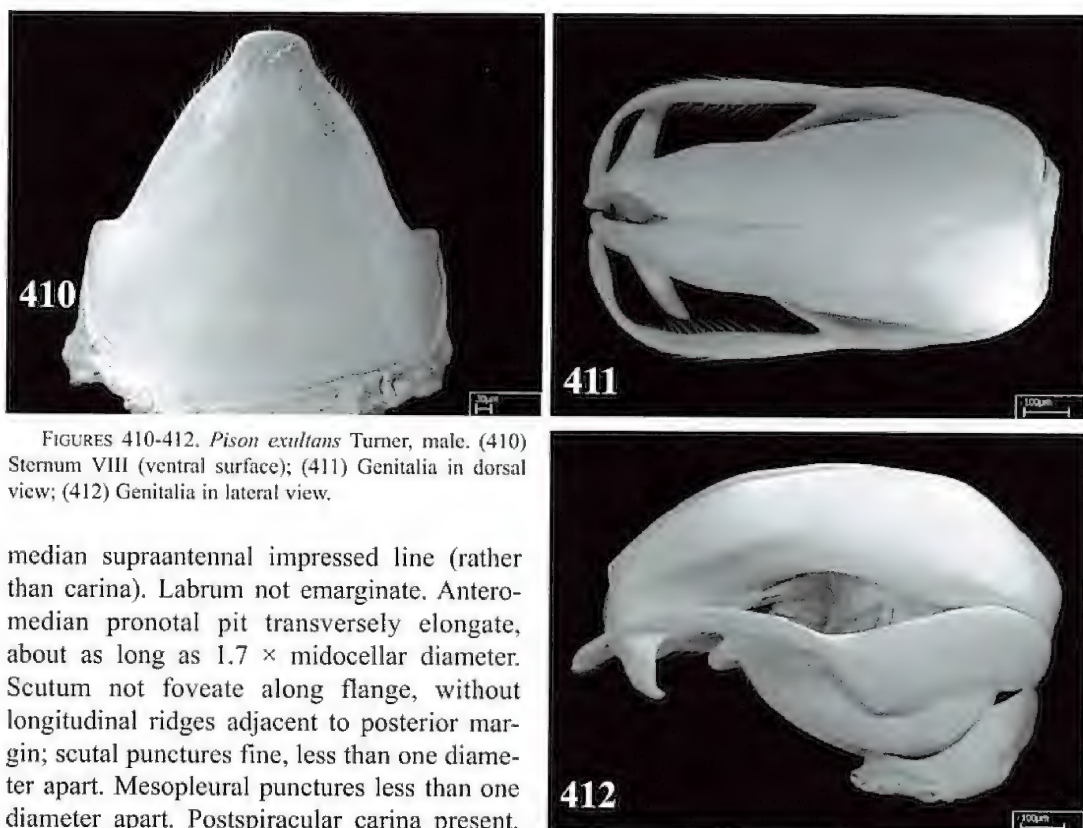
**RECOGNITION.**—*Pison exultans* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It is characterized by a fine median supraantennal impressed line (rather than a carina) and elongate tergum I (length greater than apical width). The female has a ferruginous antennal base combined with ferruginous tergum I, with a pair of black spots in many specimens. The male has tergum I all or partly ferruginous (at least basal quarter ferruginous) and triangular sternum VIII, with roundly truncate apical margin (as in *P. exornatum*, in which tergum I is wider than long). Tergum I is also elongate in some *P. basale*, in which the frons has a median carina and the tegula is angulate posteriorly (rounded in *P. exultans*).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart, with



FIGURES 404-409. *Pison exultans* Turner. (404) Female clypeus and mandibles; (405) Male clypeus and mandibles; (406) Female tergum I in dorsal view; (407) Tergum I of melanotic male in dorsal view; (408) Gastral segment I of female in lateral view; (409) Female tergum VI in dorsal view.





FIGURES 410-412. *Pison exultans* Turner, male. (410) Sternum VIII (ventral surface); (411) Genitalia in dorsal view; (412) Genitalia in lateral view.

median supraantennal impressed line (rather than carina). Labrum not emarginate. Antero-median pronotal pit transversely elongate, about as long as  $1.7 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Mesopleural punctures less than one diameter apart. Postspiracular carina present, about half as long to as long as midocellar diameter. Metapleural sulcus, in most specimens, costulate between dorsal and ventral metapleural pits, not costulate in some. Propodeum in most specimens with irregular longitudinal carina that separates side from dorsum and posterior surface and extends from gastral socket area toward spiracle (carina crossed by short, transverse ridges); in some specimens carina replaced by row of short, transverse ridges; in other specimens both carina and ridges evanescent; dorsum with middle carina in shallow sulcus, sulcus with small, short, oblique ridges; remaining dorsum with oblique carinae that are conspicuous basally but become gradually evanescent posterolaterally, finely punctate between ridges; side finely punctate, also ridged at least anteriorly (ridges varying from fine to conspicuous); posterior surface punctate, with interspaces merging in most specimens into fine, irregular, transverse ridges. Hindcoxal dorsum with outer margin not carinate. Tergum I sloping gently toward base (Fig. 408), markedly less so than in most other *Pison*, its punctures minute, less than one diameter apart. Sterna punctate throughout, punctures small but well defined.

Setae silvery (with golden tinge on frons, pronotum, scutum, scutellum, and postscutellum, also on clypeus in many specimens), appressed on thorax, forecoxal venter, femoral venters, and tergum I, completely concealing integument on clypeus in male but not in female; setae of lower gena slightly curved, subappressed to suberect, slightly longer than half midocellar diameter to about as long as midocellar diameter. Tergum I and IV and following with golden or silvery apical setal fasciae, but terga II and III varying: in most specimens, tergum II has all setae black, contrasting with those of terga I and III; in many specimens from northern Queensland apical depression of tergum III has golden setae inconspicuous, visible only from certain angles, or totally absent, as on tergum II (thus contrasting with terga I and IV); finally, in some specimens, apical

depressions of terga II and III have golden setal fasciae, like other terga (males of all three forms have identical characteristic sternum VIII and genitalia, showing that only one species is involved).

Head, thorax, and propodeum black (pronotal lobe ferruginous in some specimens); mandible largely ferruginous, black basally, dark brown apically; scape, pedicel, and two to seven basal flagellomeres ferruginous in most specimens, but all black in some males. Femora largely black, reddish black apically (forefemur all ferruginous in some specimens), tibiae, and tarsi ferruginous. Tergum I ferruginous with a pair of dark spots mesally in most specimens (Fig. 406), but without dark spots in some individuals, and largely black in some males, with only basal quarter ferruginous (Fig. 407); tergum II all black, remaining terga black, in most specimens with brown apical depressions

♀.—Upper interocular distance equal to  $0.64\text{--}0.68 \times$  lower interocular distance; ocellular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $1.02\text{--}1.04 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 404). Dorsal length of flagellomere I  $1.7\text{--}2.0 \times$  apical width, of flagellomere IX  $0.9\text{--}1.0 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Tergum VI rounded apically (Fig. 409). Length 9.6–12.1 mm; head width 2.3–2.5 mm.

♂.—Upper interocular distance equal to  $0.70\text{--}0.76 \times$  lower interocular distance; ocellular distance equal to  $0.7\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $1.04\text{--}1.10 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 405). Dorsal length of flagellomere I  $1.6\text{--}1.8 \times$  apical width, of flagellomere X  $0.9 \times$  apical width. Sternum VIII convex along midline, apical margin roundly truncate (Fig. 410). Genitalia: apical half of gonocoxite modified into long, narrow filament (Figs. 411, 412), similar to that of *P. elongatum*. Length 7.5–8.7 mm; head width 1.9–2.3 mm.

#### GEOGRAPHIC DISTRIBUTION (Fig. 413).—

New South Wales, Queensland, South Australia, Victoria.

#### RECORDS.— AUSTRALIA: Australian Capital

Territory: Black Mountain at  $35^{\circ}15'S$   $149^{\circ}06'E$  (1 ♀, 1 ♂, AMNH) and  $35^{\circ}16'S$   $149^{\circ}06'E$  (2 ♂, CAS; 1 ♀, 4 ♂, UCD), Wombat Creek 6 km NE Piccadilly Circus at  $35^{\circ}19'S$   $148^{\circ}51'E$  (1 ♂, ANIC).

**New South Wales:** Bilpin in Blue Mountains (1 ♀, AMS), 6 km NE Bilpin (1 ♂, AMS), Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (1 ♀, 19 ♂, CAS), 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (2 ♂, CAS), Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$  (5 ♂, CAS), Lake George Cullerin (1 ♀, UCD), Mount Tomah in Blue Mountains (1 ♂, AMS), 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$  (13 ♂, CAS), Orange: Botanic Gardens at  $33^{\circ}15.3'S$   $149^{\circ}05.7'E$  (5 ♂, CAS), Warrenburg National Park (1 ♀, UCD), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (1 ♂, CAS) and  $31^{\circ}16'S$   $148^{\circ}57'E$  (3 ♀, MNKB), near Warrumbungle National Park at  $31^{\circ}16.9'S$   $149^{\circ}04.8'E$  (1 ♀, 1 ♂, CAS), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (1 ♀, 4 ♂, CAS).

**Queensland:** Agnes Water 40 km E Miriam Vale (1 ♂, AMS), 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$  (1 ♀, ANIC), 7 km S Batavia Downs at  $12^{\circ}43'S$   $142^{\circ}42'E$  (1 ♀, ANIC), 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$  (1 ♀, 1 ♂, ANIC), Beaudesert (1 ♂, QMB), Brisbane: Blunder Creek (1 ♂, QMB), Brisbane: Karawatha Forest at  $27^{\circ}38.6'S$   $153^{\circ}04.2'E$  (2 ♂, CAS), Brisbane: Mount Coot-tha (5 ♂, CAS), Carnarvon National Park at  $25^{\circ}04.0'S$   $148^{\circ}14.7'E$  (2 ♂, CAS), Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$  (7 ♀, 1 ♂, ANIC), Crediton State Forest at



FIGURE 413. Collecting localities of *Pison exultans* Turner.



21°11.9'S 148°29.9'E (1 ♀, CAS), Edungalba (1 ♀, ANIC), Eungella National Park at 21°10.5'S 148°30.3'E (6 ♀, 2 ♂, CAS), Gunshot Creek at 11°45'S 142°28'E (1 ♀, ANIC), Heathlands at 11°45'S 142°35'E (1 ♀, ANIC), 12 km SSE Heathlands at 11°51'S 142°38'E (1 ♀, ANIC), Homevale National Park at 21°26.9'S 148°32.4'E (7 ♂, CAS), Kuranda (1 ♀, CAS), 5 km NE Leyburn (1 ♂, CAS), near Mareeba (1 ♀, CAS), 48 km E Mount Surprise at 18°09.0'S 144°43.6'E (1 ♀, 1 ♂, CAS), 3 km ENE Mount Tozer at 12°44'S 143°14'E (1 ♀, ANIC), Mount Walsh National Park near Biggenden (1 ♂, ANIC), Mungumby Lodge near Helenvale (1 ♂, SAM), 2 km N Rokeby at 13°39'S 142°40'E (9 ♀, 7 ♂, ANIC), 13 km SE Weipa at 12°40'S 143°00'E (1 ♀, ANIC). **South Australia:** Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (18 ♀, 14 ♂, CAS), 3 km ENE Wilpena at 31°31.0'E 138°36.6'E (2 ♀, 2 ♂, CAS). **Victoria:** no specific locality (1 ♂, BMNH, lectotype of *Pison exultans*). **Locality unknown:** Cove Cave (1 ♂, AMS).

### *Pison fenestratum* F. Smith

Figures 414-421.

*Pison nitidum* F. Smith, 1868:248, ♀ (as *nitidus*, incorrect original termination), junior primary homonym of *Pison nitidum* F. Smith, 1859. Lectotype: ♀, Australia: Western Australia: Champion Bay, now Geraldton (BMNH), **present designation**, examined. – Maindron, 1879:180 (nesting habits, redescription of species).

*Pison fenestratum* F. Smith, 1869:291 (as *fenestratus*, incorrect original termination). Substitute name for *Pison nitidum* F. Smith, 1868. – Kohl, 1885:187 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:711 (in catalog of world Hymenoptera, as *fenestratus*); Turner, 1916b:596 (in key to Australian *Pison*), 603 (comparison with *Pison festivum*, as *fenestratus*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

*Pison scabrum* Turner, 1908:509, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. **New synonym.** – Turner, 1916b:598 (in key to Australian *Pison*), 608 (comparison with *Pison congener* and *P. nitidum*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:262 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Smith (1868) did not mention the number of the specimens examined in the original description of *Pison nitidum*, but two females that he studied are present in the Natural History Museum, London. I have labeled as the lectotype the one bearing Smith's original label "*Pison nitidus*" and the other one as a paralectotype of this species.

Similarly, Turner (1908) did not indicate the number of specimens examined in his original description of *Pison scabrum*. I have selected as the lectotype of this species the only specimen in The Natural History Museum, London, collected at Mackay (the type locality) and bearing a label "*Pison scabrum* Turner Type" in his handwriting.

**JUSTIFICATION OF NEW SYNONYMY.**— In his key to Australian *Pison*, Turner (1916b) correctly placed *Pison fenestratum* among the species with the "second ventral segment shining, almost or entirely impunctate". He was wrong in assigning *Pison scabrum* to the species with the "second ventral segment closely and more or less distinctly punctate", thus treating it as a species well different from *fenestratum*. In fact, the lectotype of *scabrum* has the sternal sculpture exactly like *fenestratum*, and is otherwise identical to that species. I treat the two names as synonyms.

**RECOGNITION.**— *Pison fenestratum* is an all black species of large size (length 12.9-13.2 mm in female, 8.2-11.5 mm in male), with the setae black on the scutum and erect on tergum I, the mesopleural punctures less than one diameter apart, and sterna III and IV mesally impunctate or with a few, sparse punctures. Also, the mandible is simple (posterior margin not step-like, inner margin not tridentate in female and not bidentate in male), and the female gena is punctate and setose on each side of the oral fossa. It resembles *P. festivum* and *P. pauper*, but differs in having the setae silvery on the apical depression of terga (rather than golden on terga III-V). In most spec-



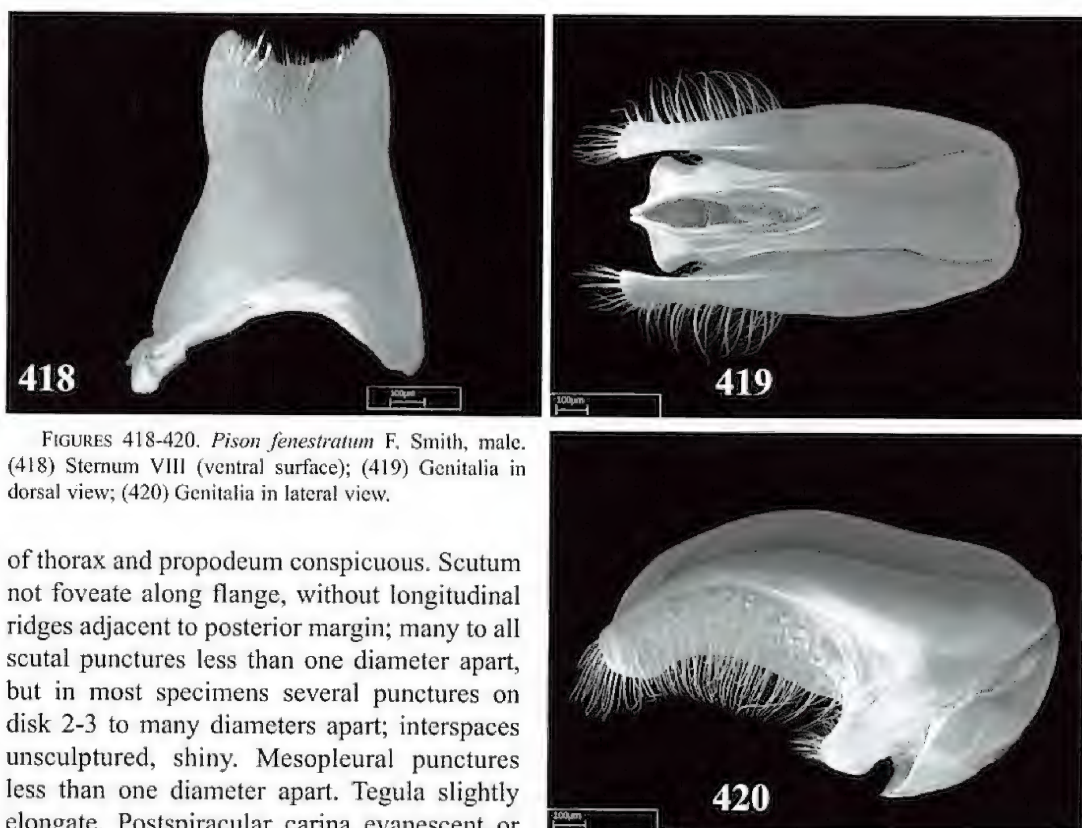
FIGURES 414-417. *Pison fenestratum* F. Smith. (414) Female clypeus and mandibles; (415) Male clypeus and mandibles; (416) Female terga I and II from behind (arrow shows tumescence on tergum I); (417). Basal flagellomeres of male.

imens, some punctures near the center of the scutum are 2-3 to many diameters apart near the center (rather than up to 1-2 diameters apart).

*Pison fenestratum* shares with *P. congener* and *P. festivum* the following characteristics of tergum I (in addition to erect setae): the apical depression deep, markedly below the adjacent more anterior part of the tergum, and a median tumescence present on the base of the horizontal portion (Fig. 416), tumescence ill-defined or absent in some specimens. Unlike *P. congener*, the scutum of *P. fenestratum* is unsculptured and shiny between the punctures (rather than microsculptured and dull), sterna II-IV have only a few, sparse punctures over most of their surface (rather than being densely punctate), and male flagellomere III, and in many specimens also flagellomere II, are concave basoventrally and convex apicoventrally (Fig. 417) rather than cylindrical. Unlike *P. festivum*, the scutum of *P. fenestratum* is unsculptured and shiny between punctures (rather than finely aciculate and somewhat dull), the setal length is about  $1.0 \times$  basal mandibular width on the lower frons mesally and about  $0.5\text{-}0.7 \times$  basal mandibular width on the scutum (rather than  $1.5 \times$  and  $1.0 \times$ , respectively), and the apical depressions of terga II-IV have silvery, setal fasciae (rather than bright golden ones).

**DESCRIPTION.**—Frons dull, punctate, most punctures less than one diameter apart, but many about one diameter apart (several diameters apart on limited area lateroventrally of midocellus in lectotype of *scabrum*). Occipital carina joining hypostomal carina. Labrum not emarginate. Antero-median pronotal pit slightly transversely elongate, about as long as midocellar diameter. Punctures





FIGURES 418-420. *Pison fenestratum* F. Smith, male.  
(418) Sternum VIII (ventral surface); (419) Genitalia in  
dorsal view; (420) Genitalia in lateral view.

of thorax and propodeum conspicuous. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; many to all scutal punctures less than one diameter apart, but in most specimens several punctures on disk 2-3 to many diameters apart; interspaces unsculptured, shiny. Mesopleural punctures less than one diameter apart. Tegula slightly elongate. Postspiracular carina evanescent or absent. Metapleural sulcus finely costulate between dorsal and ventral metapleural pits. Propodeum: interspaces between most punctures merging into irregular ridges (ridges oblique on dorsum, longitudinal on side, and transverse on posterior surface); with series of short transverse ridges separating side from posterior part of dorsum and posterior surface; dorsum with fine middle carina that may be replaced by series of short, transverse carinae. Posteroventral forefemoral surface shiny, with well-defined, unevenly distributed punctures that average about two or three diameters apart. Tergum I with conspicuous punctures and unsculptured, shiny interspaces (most punctures more than one diameter apart), tumescent medially at base of horizontal portion (Fig. 416), tumescence ill defined or absent in some specimens; apical depression deep, markedly below adjacent more anterior part of tergum. Most of sternum II sparsely punctate (impunctate apico-mesally), with punctures many diameters apart, except densely punctate basally and posterolaterally (punctures about one diameter apart or less); sterna III and IV (except laterally) with a few minuscule punctures.

Setae silvery except most erect setae dark brown on upper frons, dark on scutal disk, largely concealing integument on clypeus, forming conspicuous fasciae on apical depressions of terga; erect on gena, thorax, forecoxal venter, femoral venters, and tergum I; setal length (compared with basal mandibular width): about  $1.0 \times$  on lower frons mesally, up to  $1.2 \times$  on lower gena,  $0.5-0.7 \times$  on scutum, up to  $0.5 \times$  on hindfemoral venter.

Body all black. Forewing membrane slightly to conspicuously infumate, medial cell in many specimens hyaline (except infumate along margins).

♀.— Upper interocular distance equal to  $0.6-0.7 \times$  lower interocular distance; ocellocular distance  $0.9-1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.0 \times$  hindocellar

diameter; eye height equal to  $0.90-0.94 \times$  distance between eye notches. Clypeal lamella varying: obtusely pointed in specimens from Mount Kaputar National Park, arcuate, obtusely pointed mesally in specimens from Warrumbungle National Park (Fig. 414). Dorsal length of flagellomere I  $3.3-3.5 \times$  apical width, of flagellomere IX  $1.7-1.9 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength, acetabular groove with two rows of punctures and associated setae. Tergum VI narrowly rounded apically. Length 12.9-14.5 mm; head width 4.0-4.2 mm.

♂.—Upper interocular distance equal to  $0.74 \times$  lower interocular distance; ocellocular distance equal to  $1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.1 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Clypeal lamella sharply pointed (Fig. 415). Flagellomere III (in many specimens also flagellomere II) concave basoventrally, convex apicoventrally (Fig. 417); dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII broadly emarginate (Fig. 418). Genitalia: Figs. 419, 420. Length 8.2-11.5 mm; head width 2.5-3.0 mm.

**NESTING HABITS.**—Maindron (1979) observed a nest of a *Pison* on the Ternate Island in the Malukuus that he called *P. nitidum*, although his identification is by no means certain. The nest, fixed to the wall, consisted of grains of dark earth and included two cells. It contained about 20 small spiders “voisines des Saltiques” (= close to Salticidae).

**GEOGRAPHIC DISTRIBUTION** (Fig. 421).—All Australia.

**RECORDS.**— **AUSTRALIA:** **Australian Capital Territory:** Black Mountain (1 ♂, ANIC), Picadilly Circus in Brindabella Range at  $35^{\circ}22'S$   $148^{\circ}48'E$  (1 ♀, ANIC; 1 ♂, CAS). **New South Wales:** Clarence (1 ♀, AMS), Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$  (1 ♀, CAS), 6 mi S Mendooran (1 ♀, AMS), Menindee (2 ♀, AMS), Mount Kaputar National Park (1 ♀, CAS), Nadgee Nature Reserve 10 km S Newton's Beach (4 ♀, 3 ♂, ANIC), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (8 ♀, 4 ♂, CAS), Warrumbungle National Park: Camp Pincham (1 ♀, ANIC), Whiskers 7 km WNW Hoskinstown at  $35^{\circ}24'S$   $149^{\circ}23'E$  (1 ♀, ANIC), 87 km E Wilcannia at  $31^{\circ}42.8'S$   $144^{\circ}08.6'E$  (1 ♂, CAS), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (1 ♀, CAS). **Northern Territory:** Trephina Gorge National Park at  $23^{\circ}32'S$   $134^{\circ}21'E$  (1 ♀, NTM). **Queensland:** 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$  (1 ♀, ANIC), Bluff Range S Biggenden (2 ♀, ANIC), Brisbane: Blunder Creek (12 ♀, QMB), Dalby (1 ♀, ANIC; 1 ♀, QMB), Guyndah (1 ♀, AMS), Lamington National Park (1 ♀, RMNH), 5 km N Leyburn at  $27^{\circ}58'S$   $151^{\circ}38'E$  (1 ♂, QMB), Mackay (1 ♀, BMNH, lectotype of *Pison scabrum*), 48 km E Mount Surprise at  $18^{\circ}09.0'S$   $144^{\circ}43.6'E$  (1 ♀, CAS), Mount Walsh National Park (2 ♀, ANIC), 2 km N Rokeby at  $13^{\circ}39'S$   $142^{\circ}40'E$  (1 ♀, CAS), 3 km S Tamborine (2 ♀, QMB), Tiara (1 ♂, CAS). **South Australia:** Adelaide (1 ♀, BMNH), Dingley Dell Camp in Flinders Ranges National Park at  $31^{\circ}21'S$   $138^{\circ}42'E$  (1 ♀, ANIC), Hacks Bridge at  $35^{\circ}03'S$   $138^{\circ}45'E$  (1 ♀, SAM), Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$  (6 ♀, 1 ♂, CAS), Wilpena: Pound Gap in Flinders Ranges National Park at  $31^{\circ}33'S$   $138^{\circ}36'E$  (1 ♀, ANIC), 32 km S Wilpena (1 ♀, UCD), Wirrabara (1 ♀, SAM). **Tasmania:** 9 km SE Miena (1 ♀, 1 ♂, UCD). **Victoria:** Gunbower (1 ♀, BMNH). **Western Australia:** Bodallin (1 ♂, UCD), Champion Bay, now Geraldton (3 ♀, BMNH, lectotype and paralectotypes of *Pison nitidum* Smith, 1868), 10 km W Cobra Station at  $24^{\circ}10.2'S$   $116^{\circ}23.0'E$  (2 ♂, ANIC; 1 ♂, CAS; 1 ♀, USU), 23 km ESE Cocklebiddy at  $32^{\circ}08'S$   $126^{\circ}18'E$  (1 ♀, ANIC), Dongarra (1 ♀, BMNH), Irwin River at Strawberry Station 19 km W Mingenew (1 ♂, CAS), 7 miles SE Jarrahdale (1 ♀, 1 ♂, RMNH), Kennedy Range National Park at  $24^{\circ}38.7'S$   $115^{\circ}10.7'E$  (4 ♀, ANIC; 1 ♀, CAS), 28 mi. E Leonora (3 ♀, CAS), Meekatharra-Billiluna Pool (3 ♀, 1 ♂,



FIGURE 421. Collecting localities of *Pison fenestratum* F. Smith.



SAM), Mount Augustus National Park at 24°22.8'S 116°54.2'E (1 ♀, ANIC; 1 ♀, CAS; 4 ♀, 1 ♂, USU), Pigeon Rocks at 29°55'S 119°16'E (14 ♀, 1 ♂, WAM), 13 km S Wannoo at 26°49'S 114°37'E (1 ♀, WAM), 2 km WNW Woolbernup Hill at 34°01'S 119°41'E (1 ♀, WAM), Yallingup (Turner, 1916b), Yundamindra Homestead at 29°15'S 122°06'E (1 ♀, WAM).

*Pison festivum* F. Smith

Figures 422-424.

*Pison festivum* F. Smith, 1869:296, ♀ (as *festivus*, incorrect original termination). Lectotype: ♀, Australia: Western Australia: Champion Bay, now Geraldton (BMNH), **present designation**, examined. – Kohl, 1885:187 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Turner, 1916b:596 (in key to Australian *Pison*), 603 (diagnostic characters); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION AND TYPE LOCALITY.**— Smith did not indicate the number of specimens examined in his original description. I have selected as the lectotype of *Pison festivum* the only female preserved at The Natural History, London. The original description indicates Champion Bay (now Geraldton) as the place of origin of this species, but the specimen is actually labeled "Swan R.", apparently Swan River.

**RECOGNITION.**— *Pison festivum* is an all black species, with the setae black on the scutum and erect on tergum I, the mesopleural punctures less than one diameter apart, and only a few, scattered punctures on sterna III and IV mesally. Also, the mandible is simple (posterior margin not step-like, inner margin not tridentate in female and not bidentate in male), and the female gena is punctate and setose on each side of the oral fossa. Unlike *P. fenestratum*, in which the apical depression of terga are covered with silvery setae and the scutum is unsculptured and shiny between punctures, the apical depressions of at least terga III-V of *P. festivum* are covered with bright golden setae (Fig. 423) and the scutum is slightly microsculptured and somewhat dull between punctures. Closely similar is *P. pauper* (whose male is unknown), from which *P. festivum* differs in having the scutum without longitudinal ridges adjacent to the posterior margin and the ocellocular distance of the female equal to  $1.9\text{--}2.2 \times$  hindocellar diameter. In *P. pauper*, the scutum has a few longitudinal ridges adjacent to the posterior margin, and the ocellocular distance of the female is equal to  $1.4 \times$  hindocellar diameter.

Also similar is *Pison spilopteryx*, but in *festivum* the pronotal collar dorsally and the apical depression of tergum I have silvery setae (rather than golden), the scutum is aciculate and somewhat dull between punctures (rather than unsculptured and shiny), the legs all black, and in the female the ocellocular distance is  $1.9\text{--}2.2 \times$  midocellar diameter (in *spilopteryx*, at least the hindtibial inner side and tarsi basally are ferruginous, and in the female the ocellocular distance is  $1.4 \times$  hindocellar diameter). Additionally, the forewing is uniformly nearly hyaline (in most *spilopteryx*, the forewing has a dark strip along the foremargin).

**DESCRIPTION.**— Frons dull, markedly microareolate, densely punctate, punctures less than one diameter apart. Distance between antennal socket and orbit larger than socket width. Labrum emarginate. Anteromedian pronotal pit oval, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, most of them less than one diameter apart (several punctures near center more than one diameter apart); interspaces slightly microsculptured and somewhat dull. Mesopleural punctures well defined, no more than one diameter apart; interspaces microsculptured, merging into ill-defined ridges. Postspiracular carina vestigial, about half as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeal side separated



FIGURES 422-423. *Pison festivum* F. Smith, female.  
(422) Clypeus and mandible; (423) Gaster.

FIGURE 424. Collecting localities of *Pison festivum* F. Smith.

ill-defined carina. Punctures of tergum I more than one diameter apart on anterior declivity and on anterior part of horizontal portion, less than one diameter apart on apical depression (here markedly smaller than on more anterior areas). Sternum II impunctate on disk, sterna III and IV mesally with a few, sparse, microscopic punctures.

Setae mainly silvery on clypeus, not concealing integument, dark brown on frons, black on scutum, somewhat darkened elsewhere; erect on frons, gena, thorax, forecoxal venter, femoral venters, and tergum I; setal length, compared with basal mandibular width,  $1.5 \times$  on lower frons mesally, up to  $2.0 \times$  on lower gena,  $1.0 \times$  on scutum, up to  $1.0 \times$  on hindfemoral venter; pronotal collar and tergum I without golden setae, apical depressions of terga II-V with bright golden, appressed setae (Fig. 423).

Head (including antenna and mandible), thorax, propodeum, legs, and gaster black.

♀.— Upper interocular distance equal to  $0.74-0.80 \times$  lower interocular distance; ocellocular distance equal to  $1.9-2.2 \times$  hindocellar diameter, distance between hindocelli  $1.2-1.3 \times$  hindocellar diameter; eye height equal to  $0.84-0.90 \times$  distance between eye notches. Free margin of clypeal lamella rounded (Fig. 422). Dorsal length of flagellomere I  $3.2-3.7 \times$  apical width, of flagellomere IX  $1.6-1.8 \times$  apical width. Mandible: trimmal carina with inconspicuous incision at about two thirds of length. Length 11.8 mm; head width 3.5 mm.

♂.— Upper interocular distance equal to  $0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.6 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Free margin of clypeal lamella approximately rectangular. Flagellomeres II and III concave basoven- trally, convex apicoventrally; dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Sternum VIII emarginate apically. Length 10.2 mm; head width 3.0 mm.



**GEOGRAPHIC DISTRIBUTION** (Fig. 424).— New South Wales, Queensland, Western Australia.

**RECORDS.**— **AUSTRALIA:** **New South Wales:** Clarence in Blue Mountains (1 ♂, AMS). **Queensland:** Edungalba (1 ♀, ANIC). **Western Australia:** Geraldton, as Champion Bay (1 ♀, BMNH, lectotype of *Pison festivum*, labeled "Swan R.").

***Pison flagellarium* Pulawski, species nova**

Figures 425-433.

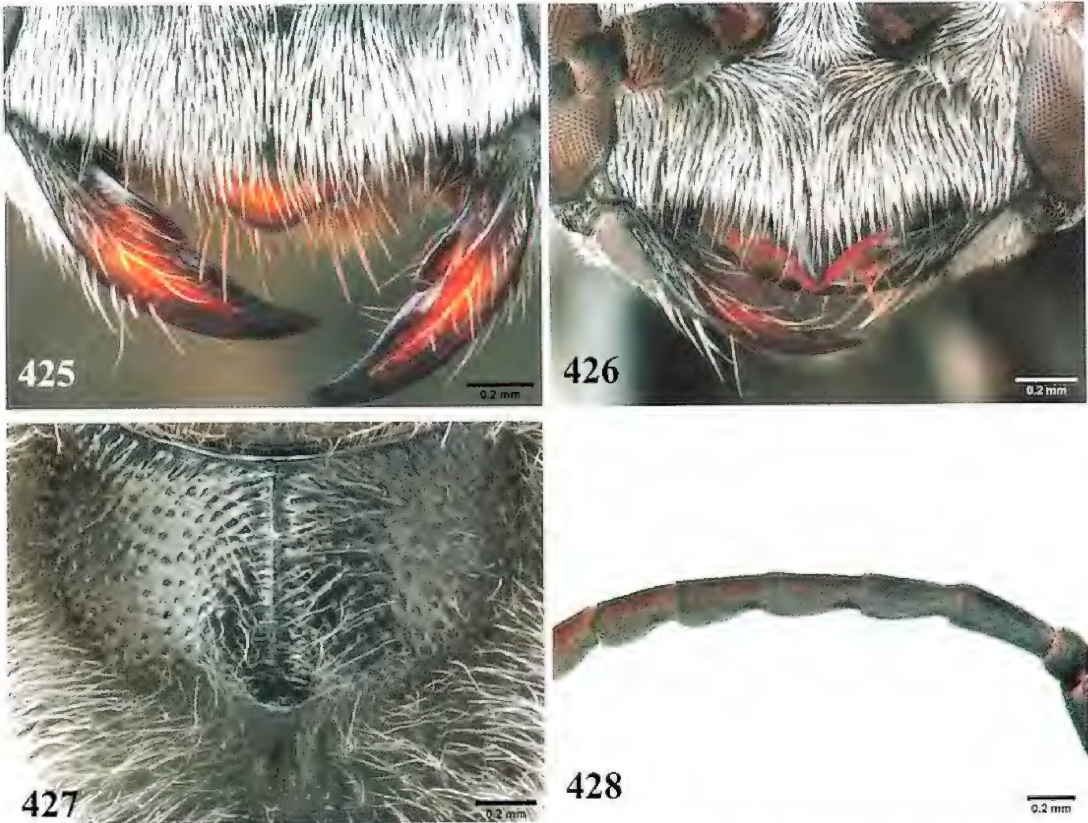
**NAME DERIVATION.**— *Flagellarius* (neuter: *flagellarium*) is a Latin adjective derived from *flagellum*; with reference to ventrally convex male flagellomeres III-VI.

**RECOGNITION.**— *Pison flagellarium* is an all black species with abundant erect setae on tergum I. It lacks specializations present in many other species with this feature: the frontal punctures are fine, the area between the antennal socket and orbit is punctate throughout, the mandibular apex is simple (not bidentate or tridentate), the mesopleural punctures are compressed against each other, the inclined part of tergum I has dense minute punctures and also somewhat larger, much sparser punctures (several to many diameters apart), the apical depressions of terga are covered with silvery setae, sterna III and IV are densely punctate, and male flagellomeres III-VI are convex ventrally. Unlike *P. tibiale*, the clypeal lamella of the female is not divided into a dorsal and a ventral portion and the ocellocular distance is about  $0.8-1.4 \times$  hindocellar diameter (rather than  $1.4-1.8 \times$ ), and male sternum VIII is evenly punctate in apical half (rather than largely unsculptured and glabrous, with setose median sulcus).

**DESCRIPTION.**— Frons dull, finely, superficially punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $1.5-2.0 \times$  as long as midocellar diameter. Scutum not foveate along flange, with or without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart except about one diameter apart behind center in some specimens. Tegula enlarged. Mesopleural punctures well defined, compressed against each other. Postspiracular carina rudimentary or absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum in most specimens without irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, but with carina in some; dorsum with ridges evanescent or absent on most or all of its surface (Fig. 427) or with ridges well defined, irregular, oblique (longitudinal in one male), interspaces punctate; side varying from finely, irregularly ridged (punctate between ridges) to mostly unridged and only punctate; posterior surface irregularly, conspicuously ridged, punctate between ridges. Posteroventral forefemoral surface finely, closely punctate. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I in female averaging about one diameter apart anterior to apical depression, in male many punctures more than one diameter apart; inclined part of tergum with dense minute punctures and with somewhat larger, much sparser punctures (several to many diameters apart). Sternum II mesally with well-defined punctures that are several to many diameters apart along midline, impunctate apicomesally; sterna III and IV sparsely to densely punctate.

Setae silvery, erect on frons, thorax, propodeum, forecoxal venter, femoral venters, and tergum I; completely concealing integument on clypeus; about as long as midocellar diameter on scutum, and hindfemoral venter (longest setae), on tergum I about  $2 \times$  midocellar diameter, on lower gena sinuous, up to  $2.0 \times$  midocellar diameter long. Apical depressions of terga with silvery, setal fasciae.

Body all black, apical depressions of sterna II-VI yellowish brown and sterna VII and VIII brown in male from Kings Mill Creek, South Australia.



FIGURES 425-428. *Pison flagellarium* Pulawski, sp. nov. (425) Female clypeus and mandibles; (426) Male clypeus and mandibles; (427) Propodeal dorsum of female; (428) Basal flagellomeres of male.

♀.— Upper interocular distance equal to  $0.66\text{--}0.74 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $0.86\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 425). Dorsal length of flagellomere I  $2.6\text{--}3.0 \times$  apical width, of flagellomere IX  $1.2\text{--}1.6 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length  $8.3\text{--}11.0$  mm; head width  $2.6\text{--}3.5$  mm.

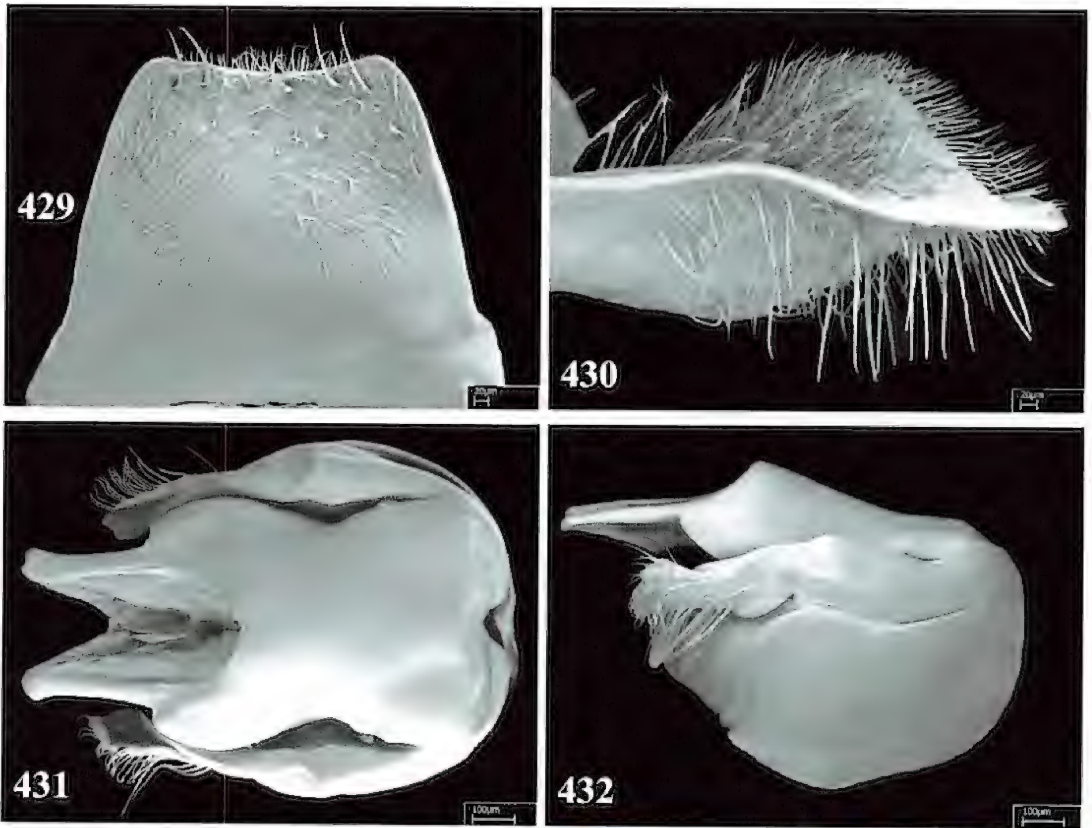
♂.— Upper interocular distance equal to  $0.78\text{--}0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.3\text{--}1.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.92\text{--}0.94 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 426). Flagellomeres III-VI concave basoventrally, convex apicoventrally (Fig. 428). Dorsal length of flagellomere I  $2.0\text{--}2.7 \times$  apical width, of flagellomere X  $0.9\text{--}1.3 \times$  apical width; median flagellomeres relatively long, dorsal length of flagellomere III  $2.5 \times$  apical width. Sternum VIII convex on ventral surface, apical margin either rounded, truncate, or shallowly, broadly emarginate (Fig. 429); lateral view: Fig. 430. Genitalia: Figs. 431-432. Length  $7.4\text{--}10.1$  mm; head width  $2.3\text{--}2.8$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 433).— New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA: Queensland:** 7 km S Batavia Downs at  $12^{\circ}43'S$   $142^{\circ}42'E$ , 19 June – 22 July 1992, P. Zborowski and E.S. Nielsen (ANIC).

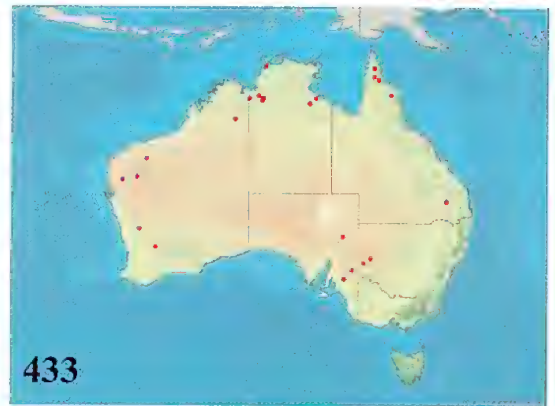
**PARATYPES:** **AUSTRALIA: New South Wales:** Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$ ,





FIGURES 429-432. *Pison flagellarium* Pulawski, sp. nov., male. (429) Sternum VIII (ventral surface); (430) Sternum VIII in lateral view; (431) Genitalia in dorsal view; (432) Genitalia in lateral view.

FIGURE 433. Collecting localities of *Pison flagellarium* Pulawski, sp. nov.



17 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS) **Northern Territory**: 12 km NNE Borroloola at 15°58'S 136°21'E, 1 Nov 1975, J.C. Cardale (1 ♀, ANIC); Buchanan Highway at 15°57'37"S 130°38'20"E, 15 June 2001, M.E. Irwin and F.D. Parker (1 ♂, CAS); 14 km NW Cape Crawford at 16°34'S 135°41'E, 6 Nov 1975, J.C. Cardale (1 ♀, ANIC); Darwin, no date, W.K. Hunt (1 ♀, SAM); Gregory National Park at 15°58.3'S 130°29.3'E, 6-9 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS), at 16°03.7'S 130°27.1'E, 24 May – 4 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♂, CAS), at 16°06.6'S 130°25.7'E, M.E. Irwin, F.D. Parker, and C. Lambkin, 24 May – 4 June 2001 (1 ♀, ANIC), and at 16°12'47"S 130°25'11"E, 5-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS); Keep River National Park at 15°57'55"S 129°01'52"E, 3-8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Victoria Highway at 15°42'40"S 130°07'48"E, 6-13 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (2 ♂, ANIC). **Queensland**: 4 km NE Batavia Downs at 12°39'S 142°42'E, 18 June – 22 July 1992, P. Zborowski and E.S. Nielsen (7 ♀, 1 ♂, ANIC; 4 ♀, CAS), 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (7 ♀, ANIC, 4 ♀, CAS), 22 Aug – 16 Sept, P. Zborowski and L. Miller (1 ♂, ANIC), 16 Sept – 24 Oct 1992, P. Zborowski and T. Weir (3 ♀, ANIC), 24 Oct – 23 Nov 1992, P. Zborowski and A. Calder

(1 ♀, ANIC), 23 Nov – 11 Dec 1992, P. Zborowski and W. Dressler (4 ♀, ANIC; 4 ♀, CAS); 5 km S Batavia Downs at 12°41'S 142°41'E, 18 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC); 7 km S Batavia Downs at 12°43'S 142°42'E, 19 June – 22 July 1992, P. Zborowski and E.S. Nielsen (3 ♂, ANIC), 23 Aug – 16 Sept 1992, P. Zborowski and L. Miller (2 ♀, ANIC), 24 Oct – 23 Nov 1992, P. Zborowski and A. Calder (1 ♀, ANIC), 24 May – 17 June 1993, P. Zborowski and I.D. Naumann (1 ♀, ANIC; 1 ♂, CAS); Coen at 13°57'S 143°12'E, 16 July – 16 Aug 1993, P. Zborowski and J. Balderson (1 ♀, ANIC), 16 Aug – 13 Sept 1993, P. Zborowski and S. Shattuck (1 ♀, 1 ♂, ANIC), 20 Oct – 16 Nov 1993, P. Zborowski and M. Horak (1 ♀, ANIC; 1 ♀, CAS); Pinnacle Creek 27 km S Archer Crossing, 29 June 1975, S.R. Monteith (1 ♀, ANIC); 2 km N Rokeby at 13°39'S 142°40'E, 13 Sept – 26 Oct 1993, P. Zborowski and D. Rentz (1 ♀, CAS); Split Rock at 15°39'S 144°31'E, 28 May – 26 June 1993, P. Zborowski and I.D. Naumann (1 ♀, ANIC), 16 July – 18 Aug 1993, P. Zborowski and J. Balderson (1 ♀, ANIC), 29 June – 24 Aug 1992 (P. Zborowski and J.C. Cardale (1 ♀, ANIC; 1 ♀, CAS), 19 Oct – 18 Nov 1993, P. Zborowski and M. Horak (1 ♀, ANIC), 30 Oct – 24 Nov 1992, P. Zborowski and A. Calder (1 ♀, ANIC). **South Australia:** 100 km SE Broken Hill at 32°51'S 141°37'E, 3–13 Oct 1988, E.D. Edwards (1 ♀, ANIC); Brookfield Conservation Park at 34°21'S 139°29'E, 24–26 Nov 1992, I.D. Naumann and J.C. Cardale (1 ♂, CAS); Kings Mill Creek near Arkoola Homestead, 29 Oct 1969, G.F. Gross (1 ♂, SAM); 79 km NNW Renmark at 33°31'S 140°24'E, 11 Oct – 9 Nov 1995, K. Pullen (2 ♂, CAS). **Western Australia:** Bodallin, 18 Nov 1979, R.M. Bohart (1 ♀, UCD); Charles Darwin Nature Reserve 7.5 km E White Wells Homestead at 29°34'47"S 117°02'23"E, 27 Oct 2008, T.F. Houston (1 ♂, WAM); Kennedy Range National Park at 24°38.7'S 115°10.7'E, 26 Apr – 10 May 2003, F.D. Parker and M.E. Irwin (1 ♀, ANIC; 1 ♀, CAS); Moola Bulla Station: Halls Creek, 1 Oct 1994, R. Paterson (1 ♀, WAM); Mount Augustus National Park at 24°19.2'S 116°48.9'E, 9–22 May 2003, F.D. Parker and M.E. Irwin (1 ♀, 1 ♂, CAS); Nanutarra – Wittenoom road at 22°26'8"S 117°49'56"E, 13–18 Apr 2005, M. Bulbert and G. Wood (1 ♀, AMS).

### *Pison flexum* Pulawski, species nova

Figures 434–441.

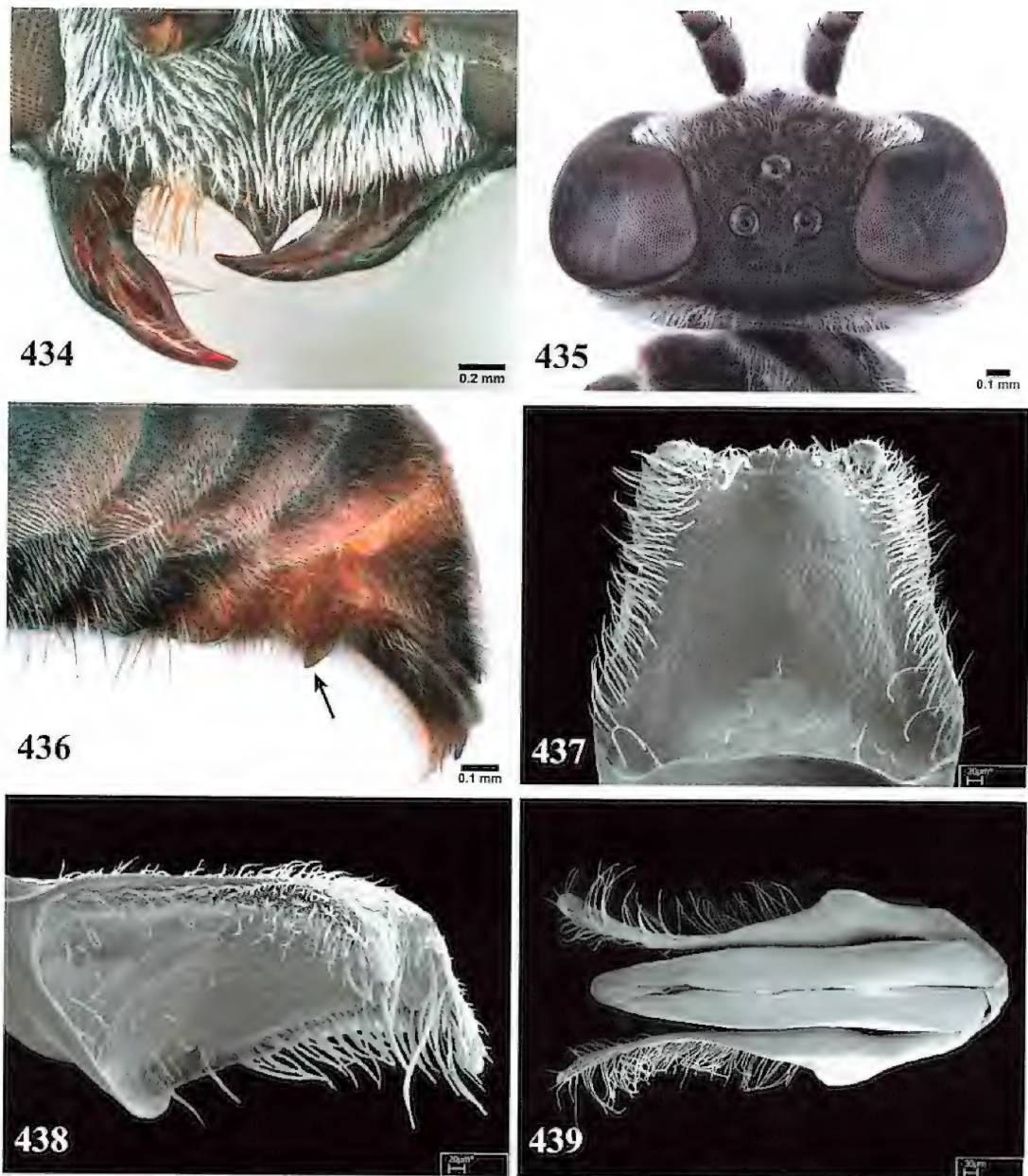
**NAME DERIVATION.**—*Flexus* (neuter: *flexum*) is the perfect passive participle of the Latin verb *flecto*, to bend; with reference to the apically bent sternum VII.

**RECOGNITION.**—*Pison flexum* is an all black species (mandible dark reddish mesally), with three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein, and setae appressed on tergum I. The female is unknown, and the male has unique sternum VII whose apical margin is turned out into a narrow vertical lamella (Fig. 436); also diagnostic is VIII whose apical margin is minimally emarginate apically and the apicolateral corner markedly bent ventrally (Figs. 437, 438).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Gena narrow in dorsal view (Fig. 435). Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine, mostly less than one diameter apart, but many punctures near center about one diameter apart. Tegula enlarged. Mesopleural punctures well defined, more than one diameter apart at center. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with well-defined, oblique ridges, with minute setigerous punctures between ridges; side punctate and finely, irregularly ridged; posterior surface with well-defined ridges, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Horizontal part of tergum I at middle, anterior of apical depression, minutely punctate, punctures 2–3 diameters apart. Sternal punctures well defined, averaging 2–3 diameters apart, apical depressions impunctate mesally.

Setae silvery, appressed on upper frons (oriented ventrally), postocellar area, scutum, and





FIGURES 434-436. *Pison flexum* Pulawski, sp. nov., male. (434) Clypeus and mandibles; (435) Head in dorsal view; (436) Gastral apex in lateral view (arrow shows bent down posterior part of sternum VII); (437) Sternum VIII (ventral surface); apicolateral corners are markedly bent ventrally and visible only partly; (438) Sternum VIII in lateral oblique view; (439) Genitalia in dorsal view.



FIGURES 440. *Pison flexum* Pulawski, sp. nov., male. (440) Genitalia in lateral view.

FIGURE 441. Collecting localities of *Pison flexum* Pulawski, sp. nov

tergum I; completely concealing integument on clypeus (except lamella); on lower gena suberect, curved, about as long as half midocellar diameter. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible dark reddish mesally.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.78 \times$  lower interocular distance; ocellocular distance equal to  $1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $1.08 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 434). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere X  $1.5 \times$  apical width. Apical part of sternum VII bent ventrally at about right angle to more anterior part (Fig. 436). Sternum VIII deeply concave, setose only laterally (except for a few subbasal setae), its apical margin shallowly, broadly emarginate (Fig. 437), its apicolateral corners markedly bent ventrally (Fig. 438). Genitalia: Figs. 439, 440. Length 6.5 mm; head width 2.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 441).— New South Wales, Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: **Western Australia:** Karijini National Park at  $22^{\circ}26.3'S$   $118^{\circ}22.9'E$ , 23 Apr – 4 May 2003, M.E. Irwin and F.D. Parker (ANIC).

PARATYPES: AUSTRALIA: **New South Wales:** 3 km N Lansdowne near Taree (1 ♂, ANIC). **Western Australia:** same data as holotype (1 ♂, CAS).

### *Pison formicarium* Pulawski, species nova

Figures 442-451.

**NAME DERIVATION.**— *Formicarium* is a Latin neuter adjective derived from *formica*, an ant. The species is named for the concurrence of specimens with the green ant, *Oecophylla smaragdina* (Fabricius), on the Greenant Creek trail in the Litchfield National Park, Northern Territory, Australia.

**RECOGNITION.**— *Pison formicarium* is an all black species with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and setae of tergum I appressed. Furthermore, the setae of the lower gena are straight or bent apically (not sinuous), about as long as the midocellar diameter.

The female shares with *P. marginatum* the punctures at the center of the upper frons (between the upper end of the middle carina and the midocellus) about one diameter apart, and the markedly microsculptured interspaces; a subsidiary recognition features is the ventral half of the metapleuron minutely punctate, the punctures being markedly smaller than those of the adjacent parts of the mesopleuron and of the propodeum (see Fig. 634). It differs from *P. marginatum* in having



the setae on the upper frons about as long as  $0.5 \times$  midocellar diameter (rather than  $1.0 \times$  midocellar diameter) and the setae of the lower gena straight or curved apically, about as long as the midocellar diameter (rather than sinuous, at least some of them as long as  $1.5 \times$  the midocellar diameter or more). Somewhat similar is *P. modestum*, in which, however, the frontal punctures are ill defined and the dorsal length of flagellomere I is  $2.4-2.6 \times$  its apical width ( $3.0-3.1 \times$  apical width in *P. formicarium*). *Pison punctifemur* is similar in having sparse punctures on the upper frons, but differs in having conspicuously large punctures on the posteroventral surface of the forefemur (Fig. 903).

The male has an acutely angulate clypeal lamella that is not concave on each side of the midpoint, the ocellocular distance  $0.7-0.8 \times$  midocellar diameter, the dorsal length of flagellomere I  $2.7-2.9 \times$  apical width, the mesopleural punctures averaging less than one diameter apart, sterna uniformly, densely punctate throughout (sternum III without transverse swelling), setae of sterna II-VII nearly appressed, and sternum VIII emarginate apically, with well defined apicolateral corners. *Pison separatum* is similar, but it differs in having the scutal punctures on the disk less than one diameter apart, the setae of the lower gena sinuous, slightly longer than the midocellar diameter, the hypostomal carina expanded, as wide next to mandibular base as  $0.5 \times$  midocellar diameter, and in many specimens an expanded occipital carina (which can be as high dorsally as  $0.5-0.9 \times$  mid-ocellar diameter); in *P. formicarium*, the scutal punctures on the disk are about 2-3 diameters apart (most specimens), the setae of the lower gena straight or curved apically, about one midocellar diameter long, the hypostomal carina is not expanded, no more than  $0.3 \times$  as high as midocellar diameter; and the occipital carina is not expanded, about as high dorsally as  $0.3 \times$  midocellar diameter.

**DESCRIPTION.**—Frons dull, punctate, punctures shallow, varying from slightly less to more than one diameter apart. Gena narrow in dorsal view (Figs. 444, 446). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $2.0-2.5 \times$  as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging about two or three diameters apart near center in most specimens, but less than one diameter apart in females from Emerald, Queensland, and Whiskers, New South Wales. Tegula enlarged. Mesopleural punctures well defined, averaging less than one diameter apart. Postspiracular carina present, about  $1.0-1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with or without irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina rudimentary in some specimens); dorsum sculpture varying: fully ridged in some specimens, or punctate with evanescent ridges (ridges well defined basally), or punctate except ridged basally (in last two cases punctures at least 1-2 diameters apart near median sulcus, but less than one diameter apart laterally); side punctate, without ridges; posterior surface ridged. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I fine to minute, more than one diameter apart on horizontal part. Sterna uniformly, densely punctate throughout.

Setae silvery, erect on scutum (about as long as  $0.5 \times$  midocellar diameter) in specimens from Queensland, appressed in those from Northern Territory; appressed on tergum I; partly concealing integument on clypeus; setae of lower gena straight, curved apically (setal length about one midocellar diameter). Apical depressions of terga with silvery, setal fasciae.

Body all black except mandibular apex brown in most specimens.

♀.—Upper interocular distance equal to  $0.50-0.58 \times$  lower interocular distance; ocellocular distance equal to  $0.3-0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6-0.7 \times$  hindocellar diameter; eye height equal to  $1.00-1.02 \times$  distance between eye notches. Free margin



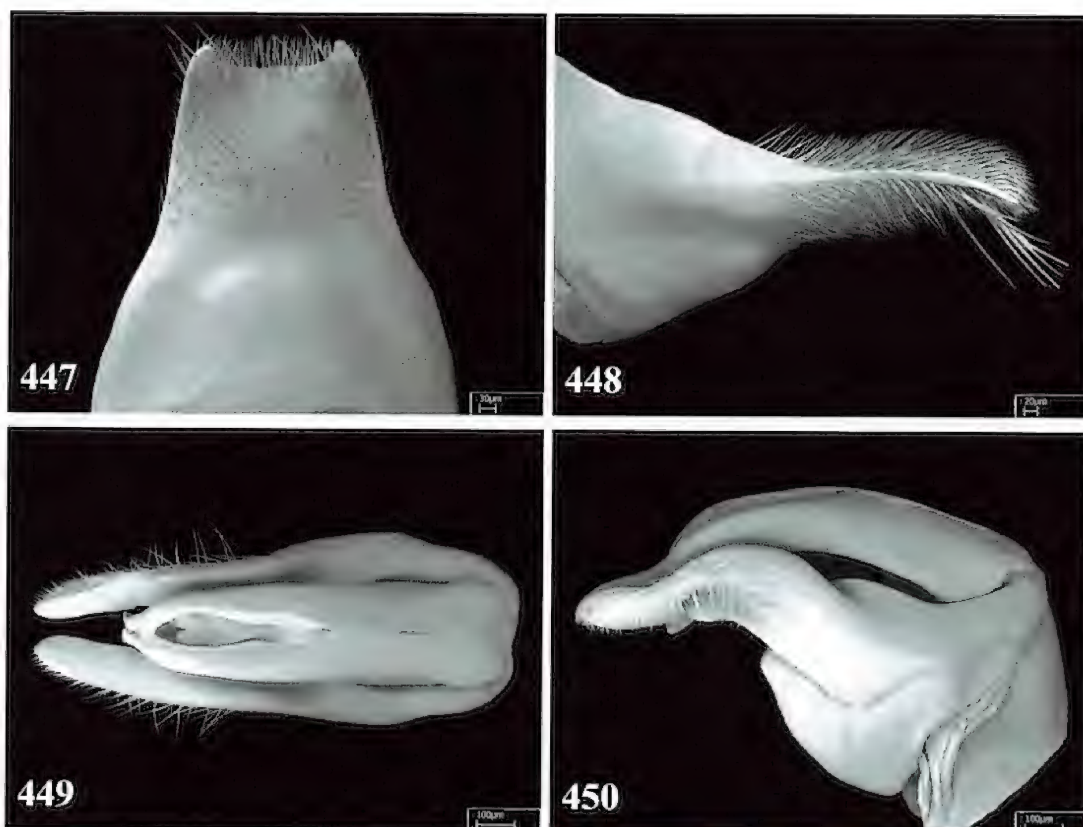
FIGURES 442-446. *Pison formicarum* Pulawski, sp. nov. (442) Female clypeus with more acute lamella and mandibles; (443) Female clypeus with more rounded lamella and mandibles; (444) Female vertex in dorsal view; (445) Male clypeus and mandibles; (446) Male vertex in dorsal view.

of clypeal lamella roundly arcuate to obtusely angulate (Figs. 442, 443), with intermediate specimens. Dorsal length of flagellomere I  $3.0-3.1 \times$  apical width, of flagellomere IX  $1.6-1.9 \times$  apical width. Mandible with incision at about midlength of trimmal carina. Length 7.9-8.7 mm; head width 2.4-2.7 mm.

♂.—Upper interocular distance equal to  $0.64 \times$  lower interocular distance; ocellocular distance equal to  $0.7-0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6-1.0 \times$  hindocellar diameter; eye height equal to  $1.00-1.02 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 445). Dorsal length of flagellomere I  $2.7-2.9 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 447), in profile: Fig. 448. Genitalia: Figs. 449, 450. Length 9.0-9.6 mm; head width 2.6-2.7 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 451).—Northern part of Northern Territory, northern Queensland.





FIGURES 447-450. *Pison formicarium* Pulawski, sp. nov., male. (447) Sternum VIII (ventral surface); (448) Sternum VIII in lateral view; (449) Genitalia in dorsal view; (450) Genitalia in lateral view.

FIGURE 451. Collecting localities of *Pison formicarium* Pulawski, sp. nov.



**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA:** **Queensland:** Heathlands at 11°45'S 142°35'E, 18 Aug – 17 Sept 1992, P. Zborowski and L. Miller (ANIC).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Berry Springs at 12°42'S 130°58'E, 7 May – 23 June 1992, Wells and Webster (2 ♀, 1 ♂, NTM); Daly River Mission, 24 June 1974, J.F. Hutchinson (1 ♀, ANIC); Elcho Island at 11°57'S 135°42'E, 4 June 1996, G.R. Brown (1 ♀, NTM); Litchfield National Park: Greenant Creek trail at 13°12.0'S 130°42.0'E, 19 Apr 2008, W.J. Pulawski and G.A. Williams (2 ♀, 1 ♂, CAS); Melville Island at 11°47'S 130°53'E, 12 Oct 1996, G.R. Brown and G. Dally (1 ♀, NTM); Virginia near Darwin at 12°33'22"S 131°02'23"E, S.M. Gregg (1 ♂, NTM). **Queensland:** Balgal Beach 51 km NW Townsville at 19°02.5'S 146°25.2'E, 18 May 2007, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 5 km S Batavia Downs at 12°41'S 142°41'E, 23 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC); Daintree National Park, 13 Jan 1999, Generani and Scaramozzino (1 intersex: clypeal lamella acutely angulate and 11 flagellomeres, as in male; gaster with six segments, tergum VI acutely arcuate, as in female, CAS); 2 km N Davies Creek National Park at 16°58.5'S 145°32.7'E, 24 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Heathlands at 11°45'S 142°35'E, 18 Aug – Sept 1992, P. Zborowski and L. Miller (1 ♂, ANIC); 14 km

NW Hope Vale Mission at 15°16'S 144°59'E, 7-10 May 1981, I.D. Naumann (1 ♀, ANIC); Melville Island: creek 1 km SW Pickertaramoor at 11°47'S 130°53'E, 12 Oct 1996, G.R. Brown and G. Dally (1 ♀, NTM); Peach Creek crossing 25 km NNE Coen, 4-5 July 1976, G.B. and S.R. Monteith (1 ♂, ANIC).

***Pison formosum* Pulawski, species nova**

Figures 452-460.

**NAME DERIVATION.**— *Formosum*, Latin neuter adjective meaning *beautiful*; with reference to this species pretty coloration.

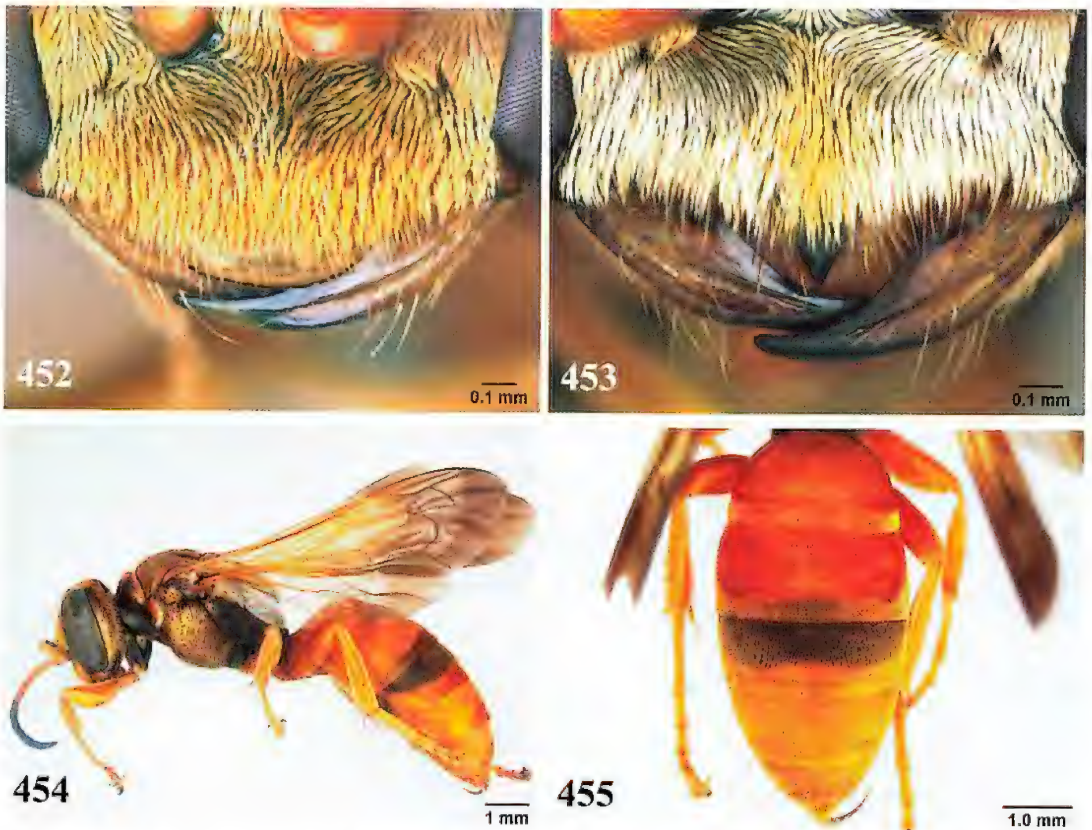
**RECOGNITION.**— *Pison formosum* has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, setae appressed on tergum I, all gastral terga ferruginous except black tergum III, and all body setae bright golden (exceptionally the setae of the clypeus and the lower frons are silvery). *Pison amabile*, *P. auratum*, and *P. basale* are similar, but *P. formosum* differs from most specimens by the gastral coloration. Additionally, the mandible is simple apically, the female clypeus is minimally convex adjacent to the lamella, the ocellocular distance is equal to  $0.9\text{--}1.3 \times$  hindocellar diameter, the longest genal setae are markedly shorter than the maximum femoral width, and the gena is setose throughout; in the male, the ocellocular distance is equal to  $1.8\text{--}2.1 \times$  hindocellar diameter, the clypeal lamella is sharply pointed and sternum VIII is shallowly emarginate. In *P. amabile*, the longest genal setae are about equal to the maximum forefemoral width, the mandible is tridentate apically in the female and bidentate in male, the female gena is asetose adjacent to the oral fossa, the clypeal lamella is arcuate in the male, and male sternum VIII is rounded apically. In *P. auratum*, the female clypeus is shallowly concave adjacent to the lamella and male sternum VIII is deeply emarginate apically (Fig. 138). In *basale*, the tegula is angulate apically (rather than rounded), at least tergum III is black (except apically), the clypeal lamella of the female is narrower (compare Figs. 178 and 452), and the ocellocular distance is  $1.0\text{--}1.4 \times$  hindocellar diameter in the male.

**DESCRIPTION.**— Frons dull, minutely punctate, punctures less than one diameter apart. Gena narrow in dorsal view. Labrum narrowly emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures minute, nearly compressed against each other (integument concealed by vestiture). Postspiracular carina evanescent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with series of transverse carinae (replacing usual longitudinal carina) that separate side from dorsum and posterior surface and extend from gastral socket area toward spiracle; dorsum punctate (punctures less than one diameter apart, a few punctures adjacent to middle sulcus can be more than one diameter apart), interspaces merging into minute, irregular ridges; side and posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures more than one diameter apart. Punctures of tergum I less than one diameter apart. Sterna punctate throughout.

Setae golden on head, thorax, propodeum, and gaster (setae of clypeus and lower frons silvery in one male from 133 km SW Marble Bar, Western Australia), both appressed and suberect on upper frons, appressed setae oriented ventrally between dorsal end of midfrontal carina and midocellus, completely concealing integument on clypeus (except lamella) and mesopleuron, nearly completely so on propodeal dorsum; longest setae of gena (about midheight) suberect, about equal to midocellar diameter; scutum with a few suberect setae (in addition to appressed setae) markedly shorter than midocellar diameter; tergum I with appressed setae; apical depressions of terga with golden setal fasciae.

Head, thorax, and propodeum black; clypeal lamella of female yellowish reddish, mostly also





FIGURES 452-455. *Pison formosum* Pulawski, sp. nov. (452) Female clypeus and mandible (453) Male clypeus and mandibles; (454) Female body in lateral view; (455) Female gaster in dorsal view.

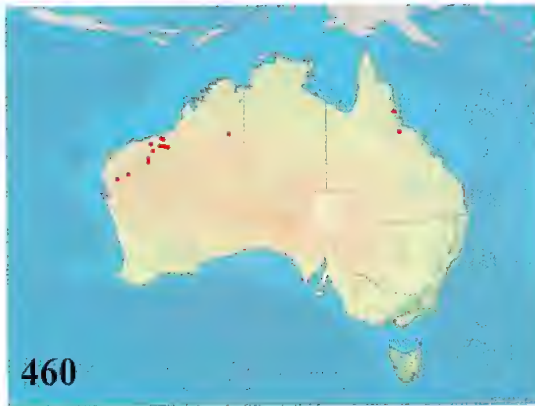
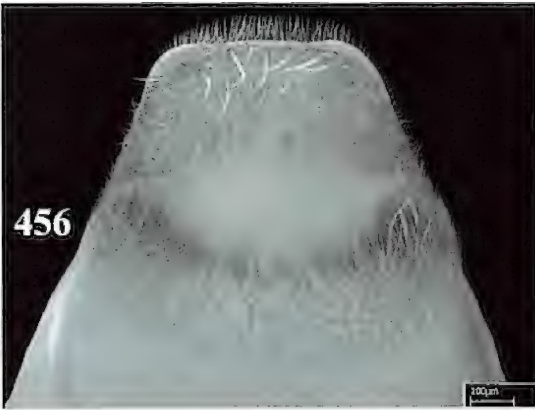
area above it; mandible black basally, yellowish reddish mesally, dark apically; scape, pedicel, and basal two or three flagellomeres ferruginous (also flagellomeres IV and V dorsally in many males). Femora, tibiae, and tarsi ferruginous. Wings yellowish basally, somewhat darkened apically (beyond cells). Gaster ferruginous, segment III (except apical depression) black (Fig. 455).

♀ (Fig. 454).— Upper interocular distance equal to  $0.68-0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.4 \times$  hindocellar diameter; eye height equal to  $0.84-0.86 \times$  distance between eye notches. Free margin of clypeal lamella arcuate, almost straight mesally (Fig. 452). Dorsal length of flagellomere I  $2.3-2.5 \times$  apical width, of flagellomere IX  $1.2-1.2 \times$  apical width. Mandible: trimmal carina with minute incision at about midlength. Length 9.1-11.7 mm; head width 2.9-3.3 mm.

♂.— Upper interocular distance equal to  $0.92-1.00 \times$  lower interocular distance; ocellocular distance equal to  $1.8-2.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4-1.8 \times$  hindocellar diameter; eye height equal to  $0.86-0.88 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 453). Dorsal length of flagellomere I  $1.9-2.1 \times$  apical width, of flagellomere X  $0.9 \times$  apical width. Sternum VIII punctate except unsculptured and asetose on basal convexity, nearly truncate apically, apicolateral arm rounded (Fig. 456), in lateral view (Fig. 457). Genitalia: Figs. 458, 459. Length 8.5-11.4 mm; head width 2.4-3.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 460).— Queensland, Western Australia.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Western Australia: 63 km E Marble Bar at  $21^{\circ}13.0'S$   $120^{\circ}20.2'E$ , 2-14 May 2003, M.E. Irwin and F.D. Parker (ANIC).



FIGURES 456-459. *Pison formosum* Pulawski, sp. nov., male. (456) Sternum VIII (ventral surface); (457) Sternum VIII in oblique lateral view; (458) Genitalia in dorsal view; (459) Genitalia in lateral view.

Figure 460. Collecting localities of *Pison formosum* Pulawski, sp. nov.

PARATYPES: AUSTRALIA: **Queensland**: 40 km N Charters Towers, 20 Aug 1986, N.W. Rodd (1 ♀, AMS); Ravenshoe, 18 Oct 1984, N.W. Rodd (1 ♀, AMS). **Western Australia** (M.E. Irwin and F.D. Parker collectors or as indicated): 10 km W Cobra Station at 24°10.2'S 116°23.0'E, 21 Apr – 10 May 2003 (1 ♂, ANIC) and 26 Apr – 10 May 2003 (7 ♂, ANIC; 4 ♀, CAS); Juna Downs Station at

22°52'31"S 118°31'49"E, 23-28 Sept 2005, CVA [= Conservation Volunteers Australia] (1 ♀, AMS); Karijini National Park at 22°28.4'S 118°32.6'E, 23 Apr – 4 May 2003 (1 ♀, ANIC); Kennedy Range National Park at 24°38.7'S 115°10.7'E, 26 Apr – 10 May 2003 (4 ♀, 1 ♂, ANIC); 25 km N Marble Bar at 20°56.2'S 118°51.0'E, 15 May 2003 (1 ♂, ANIC); 11 km E Marble Bar at 21°09.0'S 119°51.7'E, 2-14 May 2003 (1 ♀, ANIC); same data as holotype (8 ♀, 9 ♂, USU); 30 km E Marble Bar at 21°11.0'S 120°01.7'E, 2-14 May 2003 (1 ♂, ANIC); 68 km E Marble Bar at 21°13.5'S 120°21.6'E (5 ♀, 1 ♂, ANIC); 95 km E Marble Bar at 21°16.8'S 120°36.3'E, 2-15 May 2003 (3 ♂, ANIC; 3 ♀, CAS); 104 km E Marble Bar at 21°19.1'S 120°40.3'E, 2-15 May 2003 (1 ♂, ANIC); 133 km SW Marble Bar = 17 km E Woodstock Station at 21°41.6'S 119°04.8'E, 3-16 May 2003 (2 ♀, ANIC; 5 ♂, CAS); Meekatharra-Billiluna Pool, Apr 1930 – Aug 1931, Canning Stock Route Expedition (1 ♂, SAM); 47 km S Pardoo Road House on Shay Gap road at 20°22.7'S 120°01.3'E, 1-14 May 2003 (4 ♀,



5 ♂, CAS); 80 km S Pardoo Road House on Shay Gap road at 20°28.3'S 120°10.0'E, 1 Jan–14 May 2003 (7 ♂, CAS; 3 ♀, 7 ♂, USU); Yandicoogina Creek 30 km E Marble Bar at 21°11.0'S 120°01.7'E, 2–14 May 2003 (1 ♂, ANIC).

***Pison fossor* Pulawski, species nova**

Figures 461–466.

**NAME DERIVATION.**—*Fossor*, Latin for *digger*; with reference to its presumed nesting habits, deduced from the presence of the psammophore on the lower gena and the forefemoral venter; a noun in apposition to the generic name.

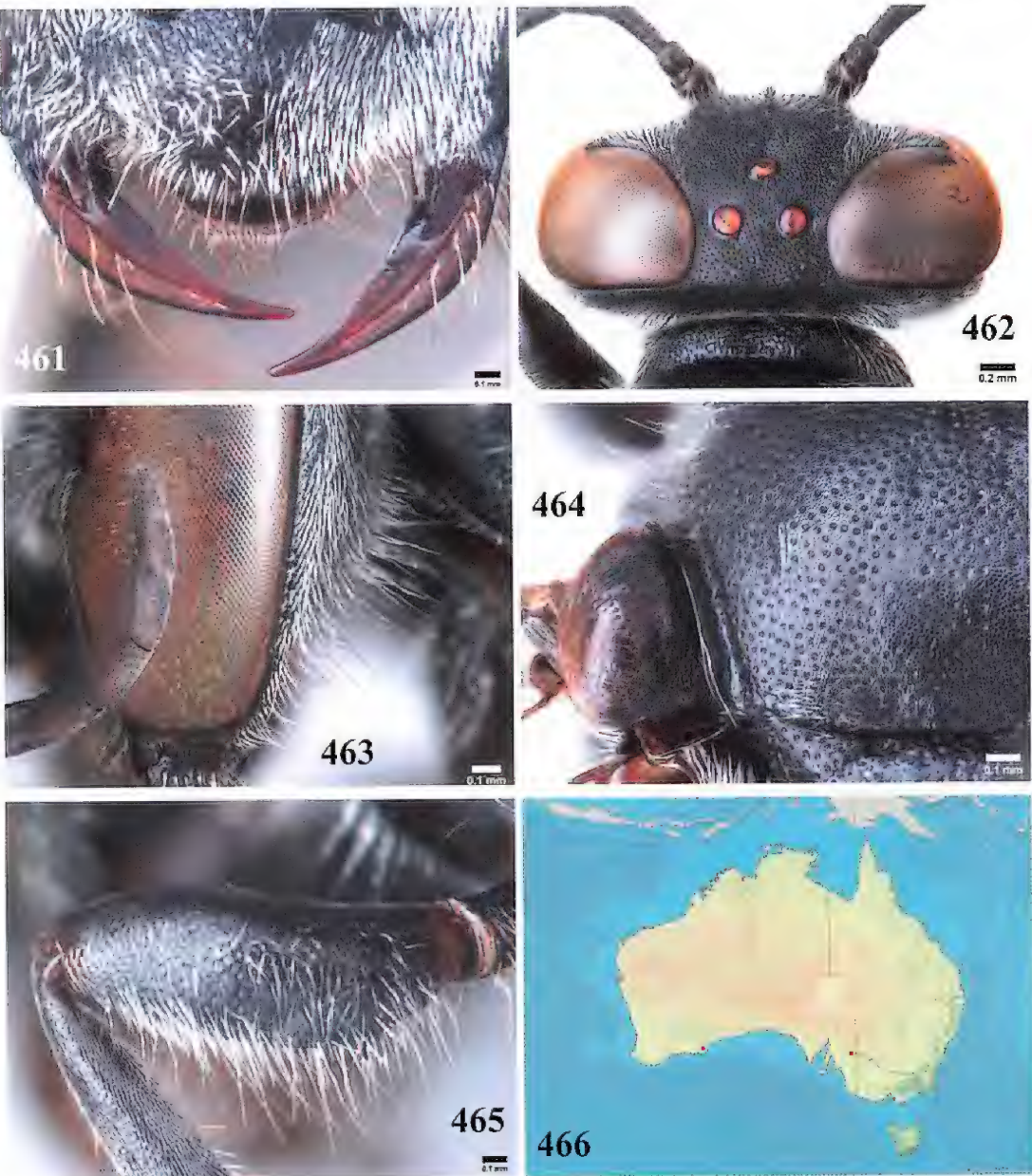
**RECOGNITION.**—The female of *P. fossor* (the male is unknown) is characterized by the presence of the psammophores on the lower gena, forecoxal venter, and forefemoral venter. This feature is shared with about 20 other species, but *P. fossor* can be recognized by the following unique combination: many scutal punctures about two diameters apart (some punctures behind center three diameters apart), the scutum with sparse, erect setae about as long as the midocellar diameter, and the propodeum without the longitudinal carina separating the side from the dorsum and posterior surface.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures averaging less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 462). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, more than one diameter apart on disk (Fig. 464), many punctures about two diameters apart, some punctures behind center three diameters apart in holotype, interspaces microscopically areolate. Tegula enlarged. Mesopleural punctures averaging less than one diameter apart, interspaces microsculptured, dull. Postspiracular carina present, about half as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (most punctures less than one diameter apart, admedian punctures more than one diameter apart), interspaces in holotype merging into fine, oblique ridges, in paratype ridged only adjacent to median sulcus; side finely, irregularly ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral punctate, punctures averaging about one diameter apart (several punctures about two diameters apart). Punctures of tergum I about two diameters apart on horizontal part anterior to apical depression. Sternum II finely punctate, punctures many diameters apart (except densely punctate next to lateral margin).

Setae silvery, in holotype both short, subappressed and erect on frons (short setae oriented dorsally on upper frons, longer setae equal to about  $1.2 \times$  midocellar diameter), only subappressed in paratype, erect on postocellar area, sparse, erect on scutum (about as long as midocellar diameter), appressed on tergum I, not concealing integument on clypeus; some setae on mesopleuron anteriorly as long as greatest forefemoral width; genal setae: see below. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.48 \times$  lower interocular distance; ocellocular distance equal to  $0.5\text{--}0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.5 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 461). Dorsal length of flagellomere I  $2.4\text{--}3.0 \times$  apical width, of flagellomere IX  $1.2\text{--}1.3 \times$  apical width. Lower gena (Fig. 463), forecoxal outer margin, and forefemoral venter (Fig. 465) with psammophores (longest setae of genal and forefemoral psammophores about



FIGURES 461-465. *Pison fossor* Pulawski, sp. nov., female. (461) Clypeus and mandibles; (462) Head in dorsal view; (463) Lower gena and its psammophore; (464) Tegula and adjacent scutum; (465) Forefemur in posterior view and its psammophore.

FIGURE 466. Collecting localities of *Pison fossor* Pulawski, sp. nov.



0.75-1.1 and 1.0-1.25 ×, respectively, of greatest forefemoral width); setae of mandibular posterior margin and those of foretrochanteral outer margin not forming psammophore, psammophore of lower gena less well defined than in similar species; lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision at about midlength. Length 6.7-7.1 mm; head width 2.2-2.5 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 466).—Southern parts of South Australia and of Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: **Western Australia:** Mount Ragged at 33°27'S 123°29'E, 22 Oct 1982, C.A. Howard and T.F. Houston (WAM).

PARATYPE: AUSTRALIA: **South Australia:** 31 km NW Renmark at 33°50'S 140°30'E, 5 Sept – 12 Oct 1995, K.R. Pullen (1 ♀, ANIC).

***Pison frontale* Pulawski, species nova**

Figures 467-470.

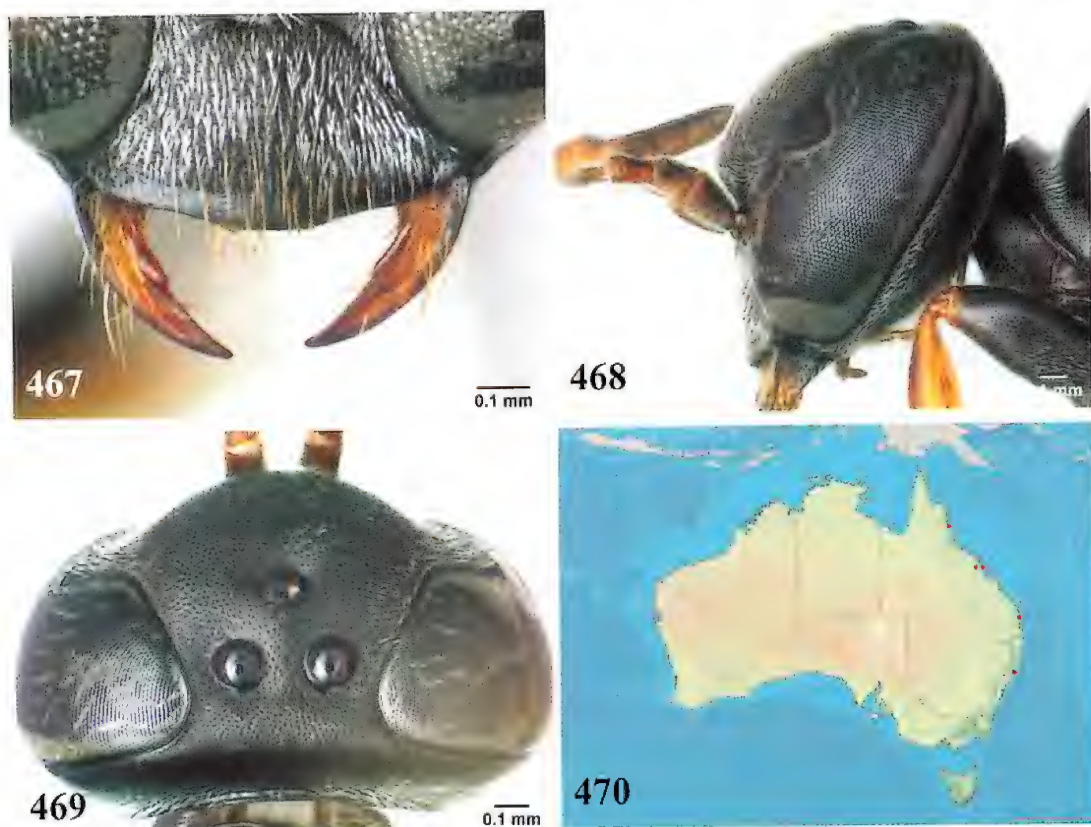
**NAME DERIVATION.**—*Frontale*, Latin neuter adjective derived from *frons*, which is conspicuously swollen in this species.

**RECOGNITION.**—*Pison frontale* has the second recurrent vein received near the middle of the second submarginal cell, the distance between the antennal socket and the orbit smaller than half the socket width, and the entire gaster ferruginous. The female differs from similar species in having the clypeal free margin not produced into a median lobe (Fig. 467), practically evenly arcuate orbit to orbit, the frons markedly swollen above the scape (Figs. 468, 469) and without middle supraantennal carina, and the integument not depressed between the ventral end of the postspiracular carina and the episternal sulcus. In addition, the posterior propodeal surface is finely ridged, the ridges being almost imperceptible in some specimens (rather than conspicuously ridged, at least partly so). The male is unknown.

**DESCRIPTION.**—Frons markedly swollen above antennal socket (Fig. 469), dull, minutely punctate, punctures superficial, about one diameter apart; middle supraantennal carina absent. Distance between antennal socket and orbit smaller than half socket width. Gena narrow in dorsal view (Fig. 468). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, almost twice as long as midocellar diameter. Scutum not foveate along flange, with minute, short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Tegula not enlarged. Mesopleural punctures fine but larger than those on scutum, about one diameter apart. Postspiracular carina present, almost as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with middle carina but without middle sulcus, finely obliquely ridged, finely punctate between ridges; side finely punctate, punctures less than one diameter apart anteriorly, averaging about 1-2 diameters apart posteriorly, ridges present only below spiracle; posterior surface punctate and finely, transversely ridged (ridges almost imperceptible in some specimens). Second recurrent vein received near middle of second submarginal cell. Hindcoxa dorsum with outer margin sharply carinate in distal half. Outer surface of hindtibia with evanescent spines. Punctures of tergum I minute, averaging about one diameter apart. Sterna punctate throughout.

Setae appressed on frons, lower gena, scutum, femora, and tergum I, oriented dorsally on frons, not concealing integument on clypeus. Terga without setal fasciae on apical depressions.

Head, thorax, and propodeum black; mandible mostly ferruginous, black basally, dark



FIGURES 467-469. *Pison frontale* Pulawski, sp. nov., female. (467) Clypeus and mandibles; (468) Head in lateral view; (469) Head in dorsal view.

FIGURE 470. Collecting localities of *Pison frontale* Pulawski, sp. nov.

apically; antenna ferruginous, largely darkened in most specimens. Femora black, tibiae, and tarsi ferruginous. Gaster ferruginous.

♀.— Upper interocular distance equal to  $1.10-1.25 \times$  lower interocular distance; ocellocular distance equal to  $0.5-0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.0 \times$  hindocellar diameter; eye height equal to  $0.96-1.00 \times$  distance between eye notches. Free margin of clypeus without median lobe, practically evenly arcuate orbit to orbit (Fig. 467). Dorsal length of flagellomere I  $1.4-1.6 \times$  apical width, of flagellomere IX  $0.9-1.0 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Tergum VI with median carina apically. Length 5.1-6.6 mm; head width 1.6-1.7 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 470).— Eastern New South Wales, eastern Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Queensland: Kuranda, 1,300 ft., 3 May – 20 June 1913, R.E. Turner (BMNH).

PARATYPES: AUSTRALIA: New South Wales: 0.5 km SE Lansdowne near Taree, 6-15 Nov 1992, G.A. Williams (1 ♀, AMS). Queensland: Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$ , 31 Oct 2006 and 8 Nov 2012, V. Ahrens and W.J. Pulawski (2 ♀, CAS); Mackay, Oct 1891, no collector given, but labeled "Turner Coll., 1909 – 49" (1 ♀, BMNH); Noosa, 26 Oct 1965, J.C. Cardale (1 ♀, CAS).



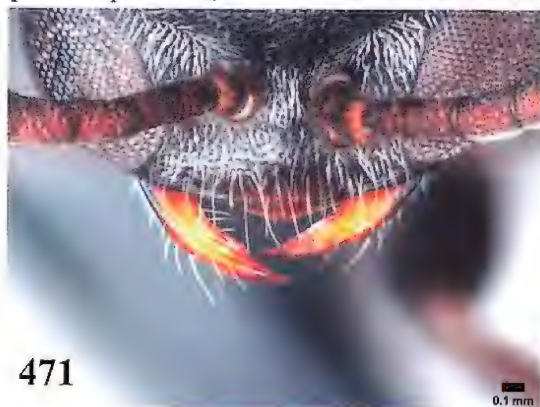
*Pison globosum* Pulawski, species nova

Figures 471-474.

**NAME DERIVATION.**— *Globosus* (neuter: *globosum*) is a Latin adjective meaning *spherical, round*; with reference to the head shape of this species.

**RECOGNITION.**— *Pison globosum* has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. The female (the male is unknown) is characterized by the clypeus not differentiated into the median lobe and lateral sections, its free margin forming an even arch from one orbit to the other (Fig. 471). Four other species (*P. laterirugosum*, *P. longulum*, *P. rotundum*, and *P. sinuosum*) share these characteristics, but unlike them the head of *P. globosum* is subspherical in dorsal view (Fig. 472), its length in dorsal view being equal to about  $0.7 \times$  its width (rather than about  $0.52 \times$ ). Also similar is *P. frontale*, but in that species the second recurrent vein is received near the middle of the second submarginal cell.

**DESCRIPTION.**— Head subspherical in dorsal view, its length in dorsal view equal to about  $0.7 \times$  its width. Frons swollen, dull, markedly microsculptured, finely punctate, punctures superficial, somewhat ill defined, less than one diameter apart; middle supraantennal carina absent. Distance between antennal socket and orbit minimally larger than socket diameter. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 472). Labrum not emarginate. Anteromedian pronotal pit round, about as wide as midocellar diameter. Scutum not foveate along flange, with-



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474

Figures 471-473. *Pison globosum* Pulawski, sp. nov., female. (471) Clypeus and mandibles; (472) Head in dorsal view; (473) Propodeal dorsum.

Figure 474. Collecting locality of *Pison globosum* Pulawski, sp. nov.

out longitudinal ridges adjacent to posterior margin; scutal punctures about one diameter apart, less than one diameter apart along midline. Tegula not enlarged. Mesopleural punctures less than one diameter apart. Postspiracular carina rudimentary, about  $0.3 \times$  as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum irregularly, obliquely ridged (Fig. 473); side slightly concave, minutely punctate and minutely ridged; posterior surface irregularly, transversely ridged. Posteroventral forefemoral surface with small but not microscopic punctures, some of which are slightly more than one diameter apart. Outer surface of hindtibia with a few evanescent spines. Punctures of tergum I minute, averaging more than one diameter apart anterior to apical depression. Sternum II punctate throughout.

Setae silvery, appressed on postocellar area, scutum, and tergum I, oriented dorsally on upper frons; on lower gena straight, appressed or nearly so, as long as  $0.2\text{--}0.3 \times$  midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, gaster, and femora black, mandible yellowish brown except black basally and at very apex; foretibia black, midtibia black, yellowish brown basally and apically, hindtibia black dorsally, ferruginous basally, apically and ventrally; tarsi ferruginous.

♀.—Upper interocular distance equal to  $1.00 \times$  lower interocular distance; ocellocular distance equal to  $1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $2.6 \times$  hindocellar diameter; eye height equal to  $1.00 \times$  distance between eye notches. Free margin of clypeal lamella forming an even arch from one orbit to the other, not concave laterally (Fig. 469). Dorsal length of flagellomere I  $1.6 \times$  apical width, of flagellomere IX  $1.0 \times$  apical width. Mandible: trimmal carina with minute incision at about two thirds of length. Length about 4.0 mm; head width 1.3 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 474).—Known from one locality in Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: Great Northern Highway 70 km at  $23^{\circ}54.3'S$   $119^{\circ}45.4'E$ , 24 Apr – 6 May 2003, M.E. Irwin and F. D. Parker (ANIC).

### *Pison gracile* Pulawski, species nova

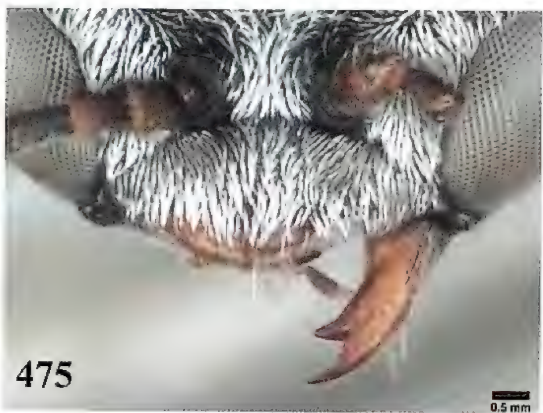
Figures 475–481.

**NAME DERIVATION.**—*Gracilis* (neuter: *gracile*) is a Latin adjective meaning *slender, slim, thin*; with reference to this species body shape and small size.

**RECOGNITION.**—*Pison gracile* is one of the smallest members of the genus, with body length of 5.0 mm. It has only two submarginal cells (Fig. 477), the second being relatively long (length of posterior margin  $1.8 \times$  its height). Furthermore, the gaster is all black, the eyes are asetose, the tegula is finely punctate throughout, except for a narrow marginal rim, the postspiracular carina is absent, the integument is not depressed between the pronotal lobe and the episternal sulcus, and the propodeum lacks a longitudinal carina separating the side from the dorsum and the posterior surface. The male (the female is unknown) is characterized by the unusually short, obtusely angulate clypeal lamella (Fig. 475), the mandible bidentate apically, and by the unusually deep apical emargination of sternum VIII (Fig. 478).

**DESCRIPTION.**—Frons somewhat shiny, finely punctate, punctures less than one diameter apart, middle supraantennal carina absent. Occipital carina joining hypostomal carina. Gena moderately narrow in dorsal view (Fig. 476). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, somewhat longer than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging about one diameter apart; interspaces unsculptured. Tegula enlarged, finely punctate throughout (except for narrow marginal rim). Mesopleural punctures almost contiguous. Postspiracular carina absent;





FIGURES 475-479. *Pison gracile* Pulawski, sp. nov., male. (475) Clypeus and mandible; (476) Head in dorsal view; (477) Distal portion of forewing; (478) Sternum VIII (ventral view); 479 (Genitalia in dorsal view); (480) Genitalia in lateral view.

integument not depressed between pronotal lobe and episternal sulcus. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum obliquely ridged; side minutely punctate (impunctate along metapleuron), punctures more than one diameter apart anteriorly, less than one diameter apart posteriorly; posterior surface only punctate in dorsal half, transversely ridged and punctate in ventral half. Forewing with two submarginal cells; posterior margin of second cell  $1.8 \times$  its height (Fig. 477). Posteroventral forefemoral surface microscopically punctate, punctures more than one diameter apart. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with only a few spines. Punctures of tergum I well defined, mostly less than one diameter apart anterior of apical depression, but some punctures more than one diameter apart mesally. Sterna punctate throughout, punctures of sternum II about two diameters apart mesally.

Setae silvery, appressed on frons, postocellar area, scutum, and tergum I, oriented ventrally on frons; completely concealing integument on clypeus except lamella, largely so on mesopleuron; on lower gena curved, shorter than midocellar diameter, appressed anteriorly, suberect near occipital carina. Apical depressions of terga with somewhat ill-defined, silvery, setal fasciae.

Head, thorax, propodeum, and gaster black; mandible yellowish except dark basally and apically. Femora black, fore- and midtibiae black except reddish brown at very apex, hindtibia ferruginous on inner side, black except brown basally and apically on outer side; tarsi ferruginous.

♀.—Unknown.

♂.—Upper interocular distance equal to  $0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.7 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Clypeal lamella unusually short, its free margin obtusely angulate (Fig. 475). Dorsal length of flagellomere I  $1.7 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Mandible bidentate apically (Fig. 475). Sternum VIII with unusually deep apical emargination (Fig. 478). Genitalia: Figs. 479, 480. Length 5.0 mm; head width 1.5 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 481).—Known from one locality in Western Australia.

**RECORDS.**—HOLOTYPE: ♂, AUSTRALIA: Western Australia: Mount Augustus National Park at  $22^{\circ}22.8'S$   $116^{\circ}54.2'E$ , 9-22 May 2003, F.D. Parker and M.E. Irwin (ANIC).



FIGURE 481. Collecting locality of *Pison gracile* Pulawski, sp. nov.

### *Pison gregorii* Pulawski, species nova

Figures 482-485.

**NAME DERIVATION.**—*Gregorii* is the genitive case of the Latin name *Gregorius*, meaning Gregory; with reference to Gregory National Park, Australia, where most specimens have been collected.

**RECOGNITION.**—*Pison gregorii* is an all black species, with three submarginal cells, the propodeum with a longitudinal carina between the dorsum and side, and setae appressed on tergum I. Furthermore, the setae on the lower gena are partly straight and partly curved, shorter than the midocellar diameter. The male is unknown, and the female shares with *P. sulcatum* the





FIGURES 482-484. *Pison gregorii* Pulawski, sp. nov., female. (482) Clypeus and mandibles; (483) Head in dorsal view; (484) Head in lateral view.

metapleuron that is conspicuously costulate along the posterior margin. It differs from that species in having an acutely angulate clypeal lamella rather than roundly arcuate (Fig. 482) and a preapical tooth on the inner mandibular margin (tooth absent in *P. sulcatum*). In many specimens most scutal punctures average 2-3 diameters apart.



**DESCRIPTION.**— Frons with median swelling shortly above antennal socket (Fig. 484), dull, minutely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 483). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, most of them averaging 2-3 diameters apart (but about 1-2 diameters apart in specimen from Taroom, Queensland, and about 3-4 in specimen from Kakadu National Park, Queensland); interspaces conspicuously microsculptured. Tegula enlarged. Mesopleural punctures fine, contiguous, partly concealed by vestiture. Postspiracular carina obtuse, ill defined. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged; side finely punctate, interspaces merging into fine to minute ridges; posterior surface conspicuously, transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I minute, averaging about one diameter apart on horizontal portion anterior to apical depression. Sterna punctate throughout, punctures well defined.

Setae silvery, appressed on frons, postocellar area, scutum, and tergum I; on upper frons (above midfrontal carina) oriented transversely, oriented radially around midocellus; on lower gena appressed or nearly so next to orbit, and erect, curved, slightly shorter than midocellar diameter next to occipital carina; largely to completely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible dark reddish in apical third.

♀.— Upper interocular distance equal to  $0.76-0.78 \times$  lower interocular distance; ocellocular

distance equal to  $1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.5 \times$  hindocellar diameter; eye height equal to  $0.86\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella roundly triangular (Fig. 482). Dorsal length of flagellomere I  $2.2\text{--}2.3 \times$  apical width, of flagellomere IX  $1.2\text{--}1.5 \times$  apical width. Mandible: trimmal carina with small incision at about apical two thirds of length, with tooth proximally of incision (Fig. 482). Tergum VI in most specimens with apicomedian carina that is slightly shorter than midocellar diameter. Length 6.7–7.5 mm; head width 2.1–2.3 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 485).—Northern part of Northern Territory, Queensland.

**RECORDS.**—**HOLOTYPE:** ♀, AUSTRALIA: Northern Territory: Keep River National Park at  $15^{\circ}57'36''\text{S}$   $129^{\circ}01'38''\text{E}$  (ANIC).

**PARATYPES:** AUSTRALIA: Northern Territory: Gregory National Park at  $16^{\circ}06'35''\text{S}$   $130^{\circ}25'39''\text{E}$ , 24 May – 4 June 2001, M.E. Irwin and F.D. Parker (1 ♀, CAS), at  $16^{\circ}06'42''\text{S}$   $130^{\circ}25'23''\text{E}$ , 24 May – 5 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS), and at  $16^{\circ}07'55''\text{S}$   $130^{\circ}26'11''\text{E}$ , 13–15 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC); 12 km S Kalkarindji at  $17^{\circ}31.2'\text{S}$   $130^{\circ}53.8'\text{E}$ , 11–17 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS); McArthur River 48 km SSW Borrooloola at  $16^{\circ}27'\text{S}$   $136^{\circ}05'\text{E}$ , 29 Oct 1975, J.C. Cardale (1 ♀, ANIC). **Queensland:** Sorcery Rocks in Kakadu National Park at  $12^{\circ}23'\text{S}$   $132^{\circ}58'\text{E}$ , 25 June 1980, I.D. Naumann (1 ♀, ANIC); 6 km N Taroom at  $25^{\circ}36'\text{S}$   $149^{\circ}46'\text{E}$ , 27 Nov 1992, G. Daniels (1 ♀, QMB).



FIGURE 485. Collecting localities of *Pison gregorii* Pulawski, sp. nov.

### *Pison gymnopareion* Pulawski, species nova

Figures 486–487.

**NAME DERIVATION.**—*Gymnopareion* is derived from two Greek words: *γυμνός*, naked, bare, and *παρῆιον*, a cheek; with reference to the impunctate and glabrous lower gena (on each side of the oral cavity).

**RECOGNITION.**—The female of *Pison gymnopareion* (the male is unknown) shares with *P. nudigenale* a unique combination of erect setae on tergum I and the lower gena impunctate and glabrous on each side of the oral cavity, with the glabrous area bordered by a psammophore. The females of the two species are quite similar morphologically, but they differ by the shape of the clypeal lamella: in *P. gymnopareion*, it is evenly arcuate and markedly broader (its corners are closer to the adjacent orbit than to each other); in *P. nudigenale*, it is obtusely tridentate and relatively narrow (its corners are closer to each other than to the adjacent orbit).

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart; middle supraantennal carina present, but hidden by vestiture. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (as in *P. nudigenale*, Fig. 722). Mandible with well-defined abductor ridge. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, contiguous. Tegula not enlarged. Mesopleural punctures well defined, contiguous. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending



from gastral socket area toward spiracle; dorsum obliquely ridged; side ridged, punctate between ridges; posterior surface irregularly transversely ridged, punctate between ridges, with several ridges radiating up from transverse carina just above gastropodeal articulation. Posteroventral forefemoral surface with well defined punctures averaging about one diameter apart. Punctures of tergum I about one diameter apart anterior to apical depression, uniform on anterior declivity. Sterna II and III impunctate mesally, with punctures several diameters apart on each side of midline.

Setae silvery, erect on frons, postocellar area, thorax, forecoxal venter, femoral venters, and tergum I; completely concealing integument on clypeus (except lamella); genal setae: see below. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.60 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella evenly arcuate, with well-defined lateral corner (Fig. 486); corners markedly closer to orbit than to each other. Dorsal length of flagellomere I  $2.8 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophore (longest setae of genal, mandibular, and forefemoral psammophores about  $1.1 \times$ ,  $1.0 \times$ , and  $1.1 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision at about two thirds of length. Length 7.0 mm; head width 2.5 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 487).—Northwestern Northern Territory, northeastern Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Northern Territory: Victoria Highway 38.5 km SW Timber Creek at  $15^{\circ}42'40''\text{S}$   $130^{\circ}07'48''\text{E}$ , 6-13 June 2001, M.E. Irwin, F.D. Parker, C. Lambkin (ANIC).

PARATYPES: AUSTRALIA: Northern Territory: same data as holotype (1 ♀, CAS). Western Australia: Drysdale River at  $15^{\circ}25'\text{S}$   $126^{\circ}55'\text{E}$ , 3-8 Aug 1975, I.F.B. Common and M.S. Upton (1 ♀, ANIC).

### *Pison hirsutum* Pulawski, species nova

Figures 488-491.

**NAME DERIVATION.**—*Hirsutum*, Latin neuter adjective meaning *hairy*, *shaggy*, *bristly*; with reference to the conspicuous, abundant pilosity of this species.

**RECOGNITION.**—*Pison hirsutum* is an all black species (mandible dark reddish mesally), with



FIGURE 486. *Pison gymnopareion* Pulawski, sp. nov., female. Clypeus and mandibles.



FIGURE 487. Collecting localities of *Pison gymnopareion* Pulawski, sp. nov.



Figures 488–490. *Pison hirsutum* Pulawski, sp. nov., female. (488) Clypeus and mandibles; (489) Tegula and adjacent scutum; (490) Mesopleuron.

three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein, and setae appressed on tergum I. The female (the male is unknown) is characterized by the presence of an impunctate and asetose area on each side of the oral fossa (except for a few, sparse punctures and associated setae). Unlike other species with this character, the impunctate area is conspicuously microareolate, and the adjacent setae, though long, do not constitute a psammophore; the psammophores are

also absent on the ventral mandibular margin and the forecoxa and midfemur. Additional recognition features include: scutal and mesopleural punctures well defined, on the scutum about 2–3 diameters apart (Fig. 489), on the mesopleuron more than one diameter apart near the center (Fig. 490), the interspaces conspicuously microareolate, dull on both areas; setae erect, about twice as long as the midocellar diameter on the upper frons, postocellar area, and lower gena, up to about  $1.5 \times$  midocellar diameter on the scutum; and the posteroventral forefemoral surface with well-defined punctures that are more than one diameter apart (as in *P. punctifemur*).

**DESCRIPTION.**—Frons conspicuously microsculptured, dull, shallowly punctate, punctures averaging less than one diameter apart. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures shallow but well defined, about 2–3 diameters apart, interspaces conspicuously microsculptured, completely dull (Fig. 489). Tegula elongate. Mesopleural punctures large, more than one diameter apart near center; interspaces microareolate, dull (Fig. 490). Postspiracular carina ill defined. Metapleural sulcus sparsely costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges evanescent laterally), punctate between ridges; side ridged, punctate between ridges; posterior surface conspicuously, transversely ridged, punctate between ridges. Posteroventral forefemoral surface with well-defined punctures more than one diameter apart. Punctures of tergum I fine, about



2-3 diameters apart before apical depression. Sterna II and III with fine punctures many diameters apart mesally.

Setae silvery (setal length, compared with width of midocellus, given in parentheses), erect on upper frons (almost  $2.0\times$ ), postocellar area (about  $2.0\times$ ), lower gena (up to  $2.0\times$ ), scutum (up to about  $1.5\times$ ), femoral venters (up to  $1.2\times$  on hindfemur), appressed on tergum I; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible reddish brown mesally.

♀.— Upper interocular distance equal to  $0.66\text{--}0.68\times$  lower interocular distance; ocellocular distance equal to  $1.0\times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4\times$  hindocellar diameter; eye height equal to  $0.86\text{--}0.88\times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 488). Dorsal length of flagellomere I  $2.2\times$  apical width, of flagellomere IX  $1.4\text{--}1.5\times$  apical width. Lower gena impunctate and asetose on each side of genal fossa (except for a few sparse punctures and associated setae), conspicuously microareolate. Mandible: trimmal carina with small incision at about midlength. Length  $7.7\text{--}8.3$  mm; head width  $2.6$  mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 491).— New South Wales, South Australia.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: New South Wales: Gilgandra Flora Reserve 8 km NE Gilgandra, 14 Aug 1983, M.E. Irwin (CAS).

PARATYPES: AUSTRALIA: New South Wales: same data as holotype (1 ♀, CAS). South Australia: Munyaroo Conservation Park at  $33^{\circ}22'41''\text{S}$   $137^{\circ}11'21''\text{E}$ , 29 Sept 2002, P. Balley (1 ♀, SAM).



Figure 491. Collecting localities of *Pison hirsutum* Pulawski, sp. nov.

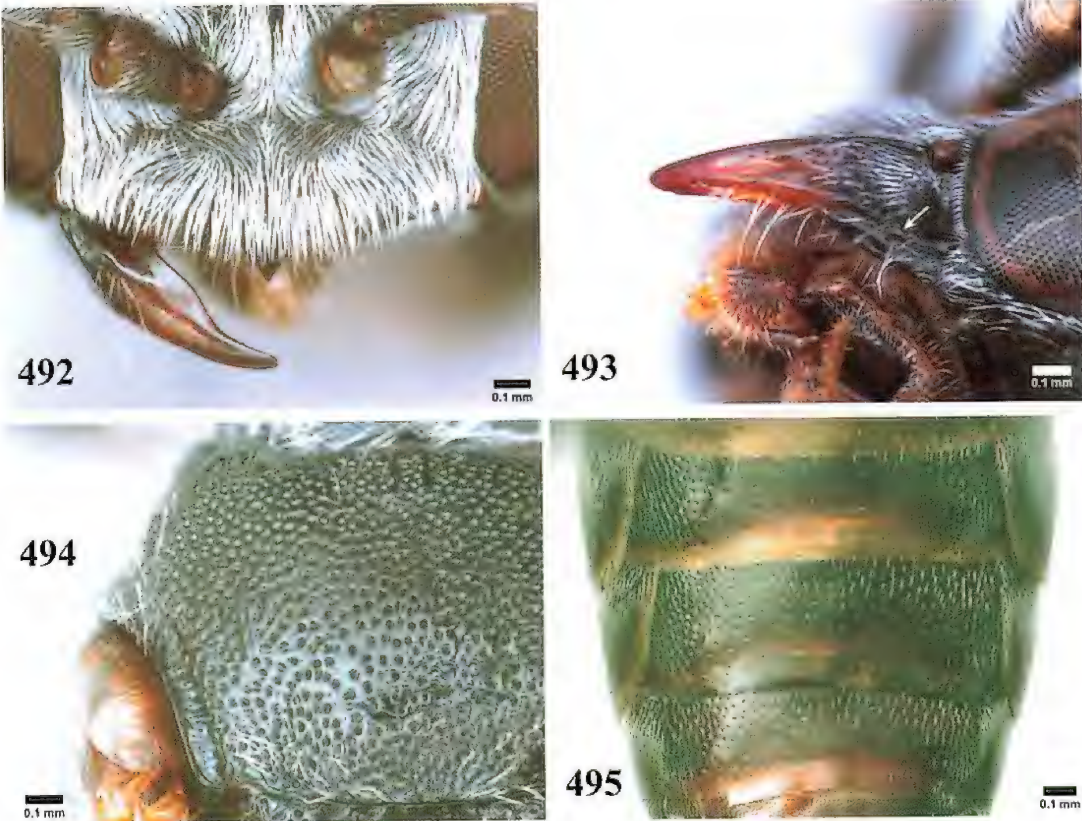
### *Pison hirticeps* Pulawski, species nova

Figures 492-499.

**NAME DERIVATION.**— *Hirticeps* is derived from two Latin words: *hirtus*, meaning *hairy, shaggy*, and the suffix *-iceps*, referring to the head; with reference to the erect setae on the head.

**RECOGNITION.**— *Pison hirticeps* has a black gaster and tibiae, three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. The male (the female is unknown) is characterized by a rounded apical margin of sternum VIII (Fig. 496), in combination with sterna II-IV sparsely punctate mesally, impunctate apicomesally (Fig. 495), and other recognition characters include: dorsal length of flagellomere I  $1.8\text{--}2.0\times$  apical width; all flagellomeres cylindrical; ocellocular distance equal to  $0.9\text{--}1.1\times$  hindocellar diameter; tegula largely impunctate and asetose; propodeum with longitudinal carina separating side from dorsum and posterior surface; apical sterna without tuft of apicolateral, erect setae. Unlike *P. psammophilos*, *P. hirticeps* has the scutal punctures not compressed against each other (Fig. 494), with the interspaces not linear, and the hindtibial spurs light (rather than dark). It differs from *P. pusillum* in having flagellomere I as long dorsally as  $1.8\text{--}2.0\times$  its apical width (rather than  $1.3\text{--}1.5\times$  apical width), the setae of upper frons oriented dorsally (rather than ventrally), and the tegula not covering the humeral plate (rather than covering in many positions).

**DESCRIPTION.**— Frons dull, finely punctate, punctures nearly contiguous. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian

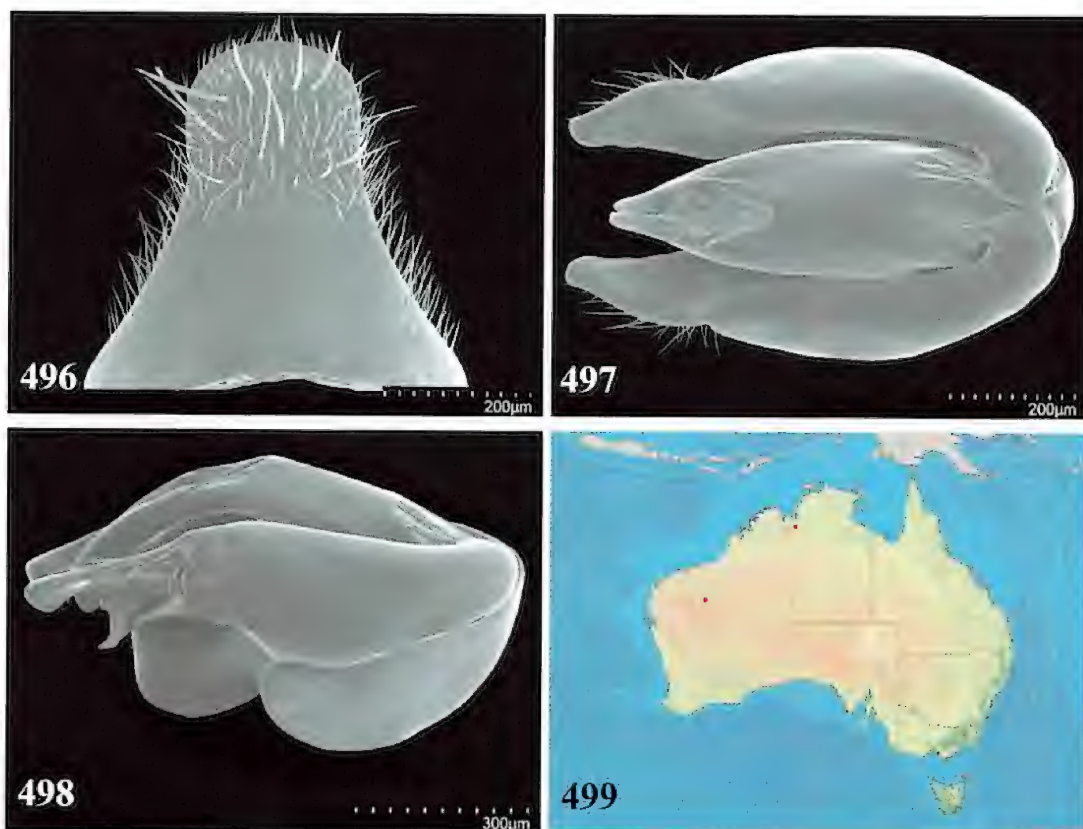


FIGURES 492-495. *Pison hirticeps* Pulawski, sp. nov., male. (492) Clypeus and mandibles; (493) Outer surface of mandible (arrow shows abductor ridge); (494) Tegula and adjacent scutum; (495) Middle sternum.

pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Propleuron partly impunctate. Scutum foveate along flange, without short, longitudinal ridges adjacent to posterior margin; scutal punctures well defined, mostly less than one diameter apart (Fig. 494), but several puncturers near center about one diameter apart (paratype) or more than one diameter apart (holotype). Scutellum foveate along anterior margin. Tegula slightly enlarged. Mesopleural punctures less than one diameter apart. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged; side slightly concave, ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface with well-defined punctures that are less than one diameter apart. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I well defined anterior of apical depression, several of them more than one diameter apart. Sterna II-IV sparsely punctate mesally, impunctate apicomesally (Fig. 495), sternum V largely impunctate mesally (except punctate near base), sternum VI impunctate.

Setae silvery, on frons oriented dorsally and shorter than midocellar diameter except for several sparse, erect setae that are about as long as one midocellar diameter; on postocellar area either all appressed or a few setae erect; on scutum mostly erect or suberect, about  $0.2 \times$  midocellar diameter, but a few sparse setae erect, up to about  $0.8 \times$  midocellar diameter; on lower gena





FIGURES 496-498. *Pison hirticeps* Pulawski, sp. nov., male. (496) Sternum VIII (ventral surface); (497) Genitalia in dorsal view; (498) Genitalia in lateral view.

FIGURE 499. Collecting localities of *Pison hirticeps* Pulawski, sp. nov.

erect, sinuous, up to about  $2.0 \times$  as long as midocellar diameter; appressed on tergum I; completely concealing integument on clypeus (except lamella). Apical depressions of terga with silvery, setal fasciae.

Body black except the following in paratype: flagellomeres III-XI brown, mandible dark reddish mesally, and tarsi ferruginous.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.80-0.82 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.4 \times$  hindocellar diameter; eye height equal to  $1.02-1.04 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 492). Dorsal length of flagellomere I  $1.8-2.0 \times$  apical width, of flagellomere X  $0.9-1.0 \times$  apical width. Mandible with abductor ridge (Fig. 493). Sternum VIII with apical margin rounded (Fig. 496). Genitalia: Figs. 497, 498. Length 5.8-6.6 mm; head width 1.9-2.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 499).— Northern Territory, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA: Western Australia:** 45 km S Newman on Great Northern Highway at  $23^{\circ}42.4'S$   $119^{\circ}44.3'E$ , 23 Apr – 6 May 2003, M.E. Irwin and F.D. Parker (ANIC).

**PARATYPE:** **AUSTRALIA: Northern Territory:** Victoria Highway 109 km WSW Timber Creek at  $15^{\circ}56'11''S$   $129^{\circ}35'22''E$ , 15-19 June 2001, M.E. Irwin and F.D. Parker (1 ♂, CAS).

*Pison hypostomale* Pulawski, species nova

Figures 500-507.

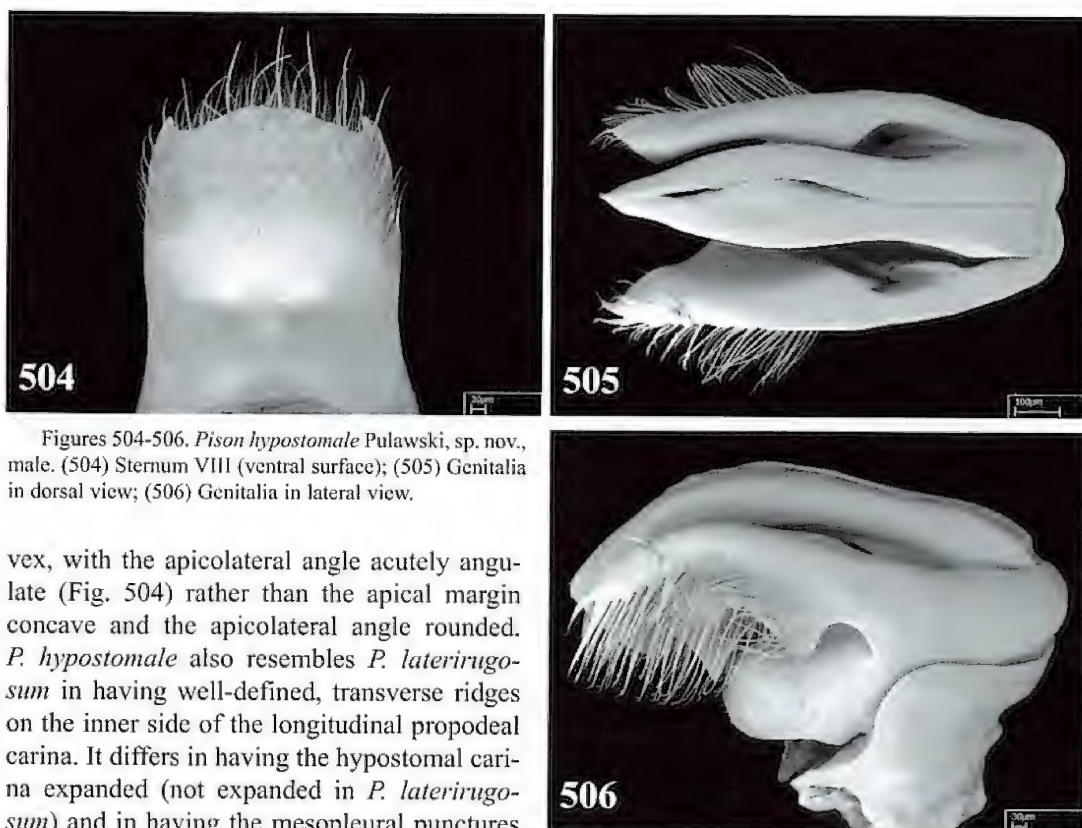
**NAME DERIVATION.**—*Hypostomale* is a Neolatin neuter adjective derived from *hypostoma*; with reference to the unusually high hypostomal carina.

**RECOGNITION.**—*Pison hypostomale* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. Like *P. pilbara* and *P. separatum*, it is characterized by an expanded hypostomal carina (Fig. 502), about as wide as  $0.5 \times$  midocellar diameter and markedly wider than the occipital carina. Unlike *P. pilbara* (whose female is unknown), it has the scutal punctures less than one diameter apart and the scutal setae appressed (rather than punctures 2-3 diameters apart and the setae erect). It differs from *P. separatum* by a number of characters: the setae are appressed and oriented ventrally between the antennal socket and the midocellus (Fig. 503) rather than oriented dorsolaterad in the frons dorsal half, the occipital carina is of the usual height (rather than expanded mesodorsally), the ocellocular distance is equal to about  $0.7 \times$  hindocellar diameter in females, about  $1.1-1.3 \times$  in males (rather than  $0.3 \times$  in females and  $0.6-0.7$  in males), the scutal and mesopleural interspaces are dull, conspicuously microsculptured (rather than shiny, unsculptured), the propodeal dorsum has conspicuous ridges joining the longitudinal carina that separates the dorsum from the side (no such ridges in *P. separatum*), the clypeal lamella of the male is obtusely angulate (Fig. 501) rather than acutely angulate, and male sternum VIII has the apical margin con-



FIGURES 500-503. *Pison hypostomale* Pulawski, sp. nov. (500) Female clypeus and mandibles; (501) Male clypeus and mandibles; (502). Posterior surface of female head in oblique view (arrow shows hypostomal carina); (503) Male frons showing orientation of setae.





Figures 504-506. *Pison hypostomale* Pulawski, sp. nov., male. (504) Sternum VIII (ventral surface); (505) Genitalia in dorsal view; (506) Genitalia in lateral view.

vex, with the apicolateral angle acutely angulate (Fig. 504) rather than the apical margin concave and the apicolateral angle rounded. *P. hypostomale* also resembles *P. laterirugosum* in having well-defined, transverse ridges on the inner side of the longitudinal propodeal carina. It differs in having the hypostomal carina expanded (not expanded in *P. laterirugosum*) and in having the mesopleural punctures about one diameter apart below midpoint (mesopleural punctures less than one diameter apart in *P. laterirugosum*).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures barely recognizable, less than one diameter apart, middle supraantennal carina absent or evanescent. Hypostomal carina expanded (Fig. 502), about as wide as  $0.5 \times$  midocellar diameter and markedly wider than occipital carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, almost as long as  $1.5 \times$  midocellar diameter. Scutum slightly foveate along flange, with inconspicuous longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart, interspaces dull, markedly microsculptured. Tegula somewhat enlarged. Mesopleural punctures well defined, averaging more than one diameter apart at center; interspaces dull, markedly microsculptured. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges becoming quite conspicuous adjacent to longitudinal carina); side ridged, punctate between ridges; posterior surface coarsely ridged. Posteroventral forefemoral surface with fine punctures about 2-3 diameters apart. Hindcoaxal dorsum with outer margin not carinate. Punctures of tergum I about two diameters apart on horizontal part medially (compressed against each other on apical depression). Punctures of sternum II several diameters apart apicomesally, apical depression impunctate.

Setae silvery, appressed on scutum and tergum I, on frons strictly appressed, oriented ventrally (Fig. 503), on lower gena subappressed, curved, up to about  $1.3 \times$  midocellar diameter long, partly concealing integument on clypeus. Apical depressions of terga with silvery setal fasciae.

Head, thorax, propodeum, legs, and gaster black, mandible black, brown apically.

♀.— Upper interocular distance equal to  $0.52 \times$  lower interocular distance; ocellocular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella broadly, obtusely angulate (Fig. 500). Dorsal length of flagellomere I  $2.4 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with minute preapical tooth. Length 6.8 mm; head width 2.2 mm.

♂.— Upper interocular distance equal to  $0.62\text{--}0.66 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $1.06\text{--}1.10 \times$  distance between eye notches. Free margin of clypeal lamella obtusely, broadly angulate (Fig. 501). Dorsal length of flagellomere I  $2.4\text{--}2.5 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII punctate, its apical margin convex except concave laterally, with sharply angulate apicolateral angle (Fig. 504). Genitalia: Figs. 505, 506. Length 6.0–6.4 mm; head width 1.9–2.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 507).— Eastern Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Queensland: Dalby, 30 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (QMB, registration number T228762).

PARATYPES: AUSTRALIA: Queensland: near Brisbane Forest Park at  $27^{\circ}26.0'S$   $152^{\circ}55.4'E$ , 19 Oct 2006, V. Ahrens and W.J. Pulawski (2 ♀, 3 ♂, CAS; 1 ♀, QMB).



FIGURE 507. Collecting localities of *Pison hypostomale* Pulawski, sp. nov.

### *Pison icarioides* Turner

Figures 508–522.

*Pison icarioides* Turner, 1908:521, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. — Turner, 1916b:595 (in key to Australian *Pison*), 599 (subgeneric placement, recognition characters); Menke, 1968a:3 (has a semipetiolate gaster); R. Bohart and Menke, 1976:337 (in checklist of world Sphecidae); Cardale, 1985:263 (in catalog of Australian Sphecidae); Naumann, 1993:184 (Australia: Queensland: Heathlands area in Cape York).

**LECTOTYPE DESIGNATION.**— Turner (1908) did not indicate the number of specimens studied, but two females are present in The Natural History Museum, London. I have selected as lectotype the one bearing the label in Turner's handwriting "*Pison (Aulacophilus) icarioides* Turner, Type", and the other one as a paralectotype.

**RECOGNITION.**— *Pison icarioides* has only two submarginal cells, and the second is unique: it is either shortly petiolate (Fig. 515) or its anterior margin is unusually narrow (Fig. 514), equal to about  $0.06\text{--}0.25 \times$  length of posterior margin. Also unique is elongate tergum I (length about  $1.4 \times$  apical width), markedly elevated above the apical depression (Fig. 517); also, the setae of the propodeum are fully appressed, completely concealing the integument on the posterior surface (Fig. 512) as well as on the apical half of tergum I (Fig. 516).

**DESCRIPTION.**— Frons dull, minutely punctate, punctures less than one diameter apart. Occipital carina expanded subdorsally and dorsally, joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Pronotal





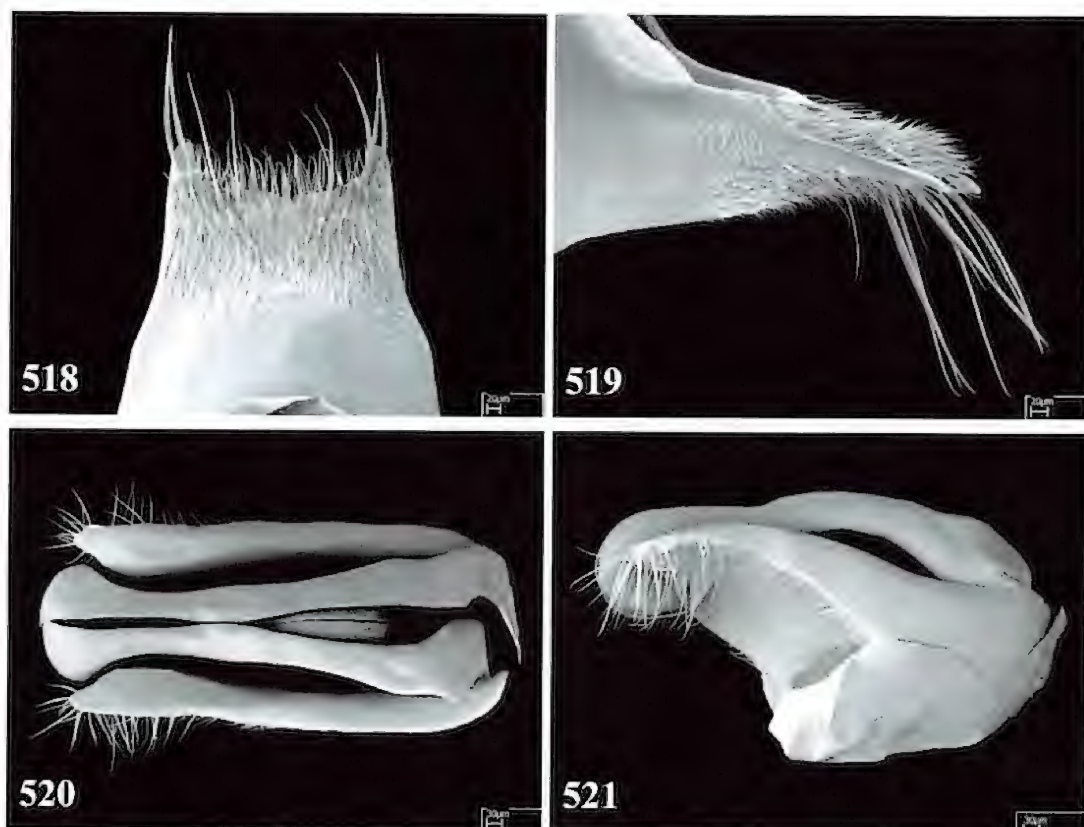
FIGURES 508-513. *Pison icarioides* Turner, female. (508) Clypeus and mandible of lectotype; (509) Vertex of lectotype; (510) Pronotal collar of lectotype; (511) Tegula and adjacent scutum of lectotype; (512) Propodeum in dorsal view; (513) Gaster in dorsal view.



FIGURES. 514-517. *Pison icarioides* Turner, female. (514) Forewing of lectotype; (515) Forewing of female from Mid Queensland; (516) Tergum I of lectotype in dorsal view; (517) Tergum I of lectotype in lateral view.

collar swollen, elongate (Fig. 510). Propleuron either densely punctate throughout (specimen from Mid Queensland) or sparsely punctate mesally. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Scutellum with slightly foveate sulcus along anterior margin. Tegula slightly enlarged, its outer margin nearly straight in anterior half (Fig. 511). Mesopleural punctures fine, less than one diameter apart. Postspiracular carina present or absent; when present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with ill-defined longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum either finely punctate, without ridges or obliquely ridged, finely punctate between ridges; side minutely punctate (interspaces merging into minute ridges anteriorly and ventrally), with a few conspicuous ridges posteroventrally in most specimens; posterior surface punctate, in most specimens with several short, conspicuous ridges emerging from gastropodeal articulation. Forewing with two submarginal cells, second cell shortly petiolate in specimens from Brisbane and Mid Queensland (Fig. 515); posterior margin of second submarginal cell in other specimens equal to  $2.3 \times$  its height, anterior margin extremely short, equal to about  $0.06-0.25 \times$  posterior margin (Fig. 514). Posteroventral forefemoral surface minutely punctate, punctures up to several diameters apart. Hindcoxa dorsum with outer margin carinate apically. Tergum I markedly convex in apical third, markedly elevated above level of apical depression (Fig. 517); tergal length about  $1.4 \times$  apical width (Fig. 516); punctures less than one diameter apart. Sternum II sparsely punctate apicomeresally (punctures several diameters apart).





FIGURES 518-521. *Pison icarioides* Turner, male. (518) Sternum VIII (ventral surface); (519) Sternum VIII in lateral view; (520) Genitalia in dorsal view; (521) Genitalia in lateral view.

Setae silvery on clypeus and basal half of tergum I, golden on upper frons, thorax, propodeum, and remaining gaster (Fig. 513); appressed on thorax, propodeum, and tergum I, suberect on lower gena and up to about  $0.5 \times$  midocellar diameter long; completely concealing integument on clypeus, posterior propodeal surface (Fig. 512), and apical third of tergum I (Fig. 513). Apical depressions of terga with golden setal fasciae (that of tergum I may be silvery).

Head, thorax, and propodeum black, but scape, pedicel and several basal flagellomeres (at least ventrally) ferruginous; clypeal lamella brown to yellowish reddish, mandible ferruginous except dark brown apically. Apices of femora, tibiae, and tarsi ferruginous. Tergum I ferruginous to black, remaining terga black, apical depressions of terga II-V brown.

♀.— Upper interocular distance equal to  $0.86-0.90 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.3 \times$  hindocellar diameter (Fig. 509); eye height equal to  $1.08-1.12 \times$  distance between eye notches. Free margin of clypeal lamella broadly, roundly triangular (Fig. 508). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere IX  $0.9-1.0 \times$  apical width. Mandible: trimmal carina with small incision at about half length. Length 10.2-11.3 mm; head width 2.3-2.6 mm.

♂.— Upper interocular distance equal to  $0.92 \times$  lower interocular distance; ocellocular distance equal to  $1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $1.00 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate. Dorsal length of flagellomere I  $1.7 \times$  apical width, of flagellomere X  $1.1 \times$  apical

width. Sternum VIII broadly emarginate apically (Fig. 518), in lateral view: Fig. 519. Genitalia: Figs. 520, 521. Length 7.5 mm; head width 2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 522).—Eastern New South Wales, eastern Queensland.

**RECORDS.**— **AUSTRALIA:** **New South Wales:** Narrabeen, a suburb of Sydney (1 ♂, ANIC). **Queensland:** Brisbane (1 ♀, QMB), 14 km ENE Heathlands at 11°41'S 142°42'E (1 ♀, ANIC; 1 ♀, CAS), Homevale National Park at 21°26.9'S 148°32.4'E (1 ♀, CAS), Mackay (2 ♀, BMNH, lectotype and paralectotype of *Pison icarioides*), Mid Queensland: no specific locality (1 ♀, BMNH), Minnie Waters (1 ♀, CAS), Moggil Farm W Brisbane (1 ♀, BISH), Mount Walsh National Park near Biggenden (1 ♀, ANIC), North Stradbroke Island: Brown Lake (1 ♀, QMB).



FIGURE 522. Collecting localities of *Pison icarioides* Turner.

***Pison illecebrosus* Pulawski, species nova**

Figures 523-529.

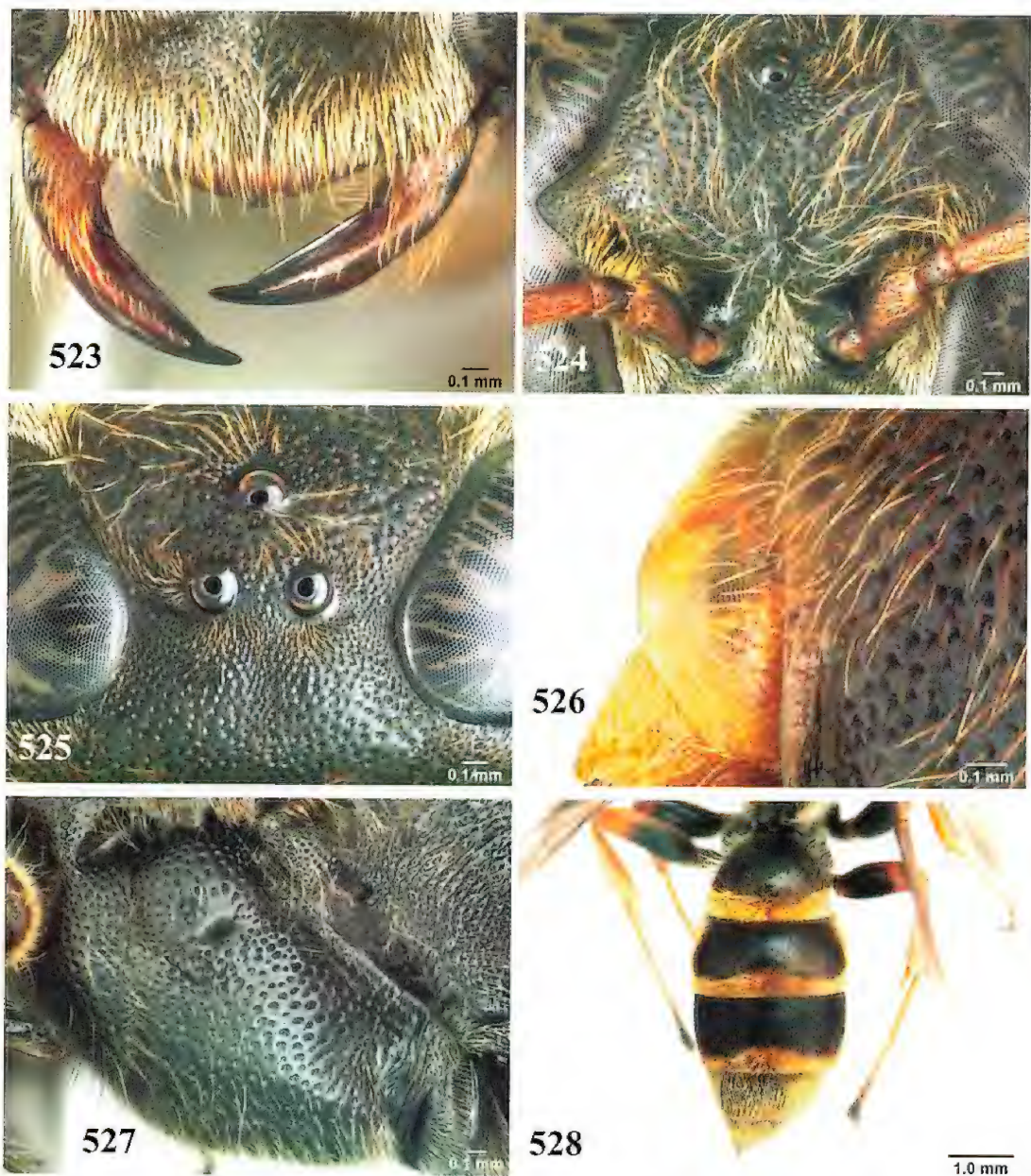
**NAME DERIVATION.**— *Illecebrosus*, Latin neuter adjective for *attractive, enticing*; with reference to this species general appearance.

**RECOGNITION.**— *Pison illecebrosus* has abundant, erect setae on tergum I. The female has a distinctive clypeus whose free margin is not concave laterally (Fig. 523). The male is unknown. The ferruginous tibiae, black gaster, and golden gastral setae are subsidiary recognition features.

**DESCRIPTION.**— Frons dull, with conspicuous punctures that average about one diameter apart (Fig. 524). Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate,  $3.0 \times$  as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined (Fig. 526), mostly less than one diameter apart, but about one diameter apart posteromesally in some specimens. Tegula enlarged. Mesopleural punctures well defined (Fig. 527), varying from more than to slightly less than one diameter apart beneath mesopleuron center; interspaces unsculptured, shiny. Postspiracular carina present but ill defined, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus minimally costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum with well-defined punctures (interspaces merging into ridges), with middle shallow sulcus containing longitudinal carina and short transverse carinae (longitudinal carina absent in some specimens); side punctate, punctures conspicuous in posterior half, interspaces merging into small ridges along anterior and ventral margins; posterior surface punctate, also ridged in at least ventral half. Posteroventral forefemoral surface with conspicuous punctures that are at least one diameter apart (some punctures about two diameters apart in some specimens). Tergum I slightly elongate, about as long as its apical width; its punctures several diameters apart on anterior slope, about one diameter apart on horizontal portion, minute, less than one diameter apart on apical depression. Punctures of sterna well defined, these of sternum II more than one diameter apart mesally.

Setae pale golden on head and thorax, golden on gaster (but silvery on tergum I and anterolaterally on tergum II in one specimen from Mount Webb, Queensland), suberect on frons, forecoxal venter, and femoral venters (setal length about  $1.5 \times$  midocellar diameter on frons and scutum, about  $2.0 \times$  midocellar diameter on forefemur; erect, sinuous on lower gena, up to about





FIGURES 523-528. *Pison illecebrosum* Pulawski, sp. nov., female. (523) Clypeus and mandibles; (524) Frons; (525) Vertex; (526) Tegula and adjacent scutum; (527) Mesopleuron; (528) Gaster in dorsal view.

$2.0 \times$  midocellar diameter; erect on tergum I; not concealing integument on clypeus. Apical depressions of terga with golden setal fasciae (Fig. 528) except black on tergum IV in specimens from Queensland.

Head, thorax, propodeum, and gaster black, female clypeus in some specimens ferruginous next to lobe free margin; mandible black basally, ferruginous mesally, dark brown at very apex; scape and pedicel either black or ferruginous, flagellomeres I and II ferruginous. Femora black (except apically), tibiae and tarsi ferruginous.

♀.— Upper interocular distance equal to  $0.68\text{--}0.70 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9\text{--}1.2 \times$  hindocellar diameter (Fig. 525); eye height equal to  $0.98\text{--}1.02 \times$  distance between eye notches. Free margin of clypeal lateral section not concave, minimally convex (Fig. 523). Dorsal length of flagellomere I  $2.7\text{--}2.8 \times$  apical width, of flagellomere IX  $1.2\text{--}1.3 \times$  apical width. Mandible: trimmal carina with small incision at about one third length. Length  $11.3\text{--}12.9$  mm; head width  $2.9\text{--}3.4$  mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 529).— Eastern New South Wales, eastern Queensland.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA:** **New South Wales:** Cairncross State Forest 15 km N Wauchope at  $31^{\circ}21'S$   $152^{\circ}47'E$ , 5 Jan 2009, D. Bray (AMS).

**PARATYPES:** **AUSTRALIA:** **Queensland:** Brisbane: Mount Coot-tha, 4 Feb 1987, W.J. Pulawski (1 ♀, CAS); Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$ , 31 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); same locality, 3 Dec 2006, W.J. Pulawski (1 ♀, CAS); 3 km NE Mount Webb at  $15^{\circ}03'S$   $145^{\circ}09'E$ , 1–30 Oct 1980, J.C. Cardale (1 ♀, ANIC) and 30 Apr – 3 May 1981, I.D. Naumann (1 ♀, ANIC).



FIGURE 529. Collecting localities of *Pison illecebrosus* Pulawski, sp. nov.

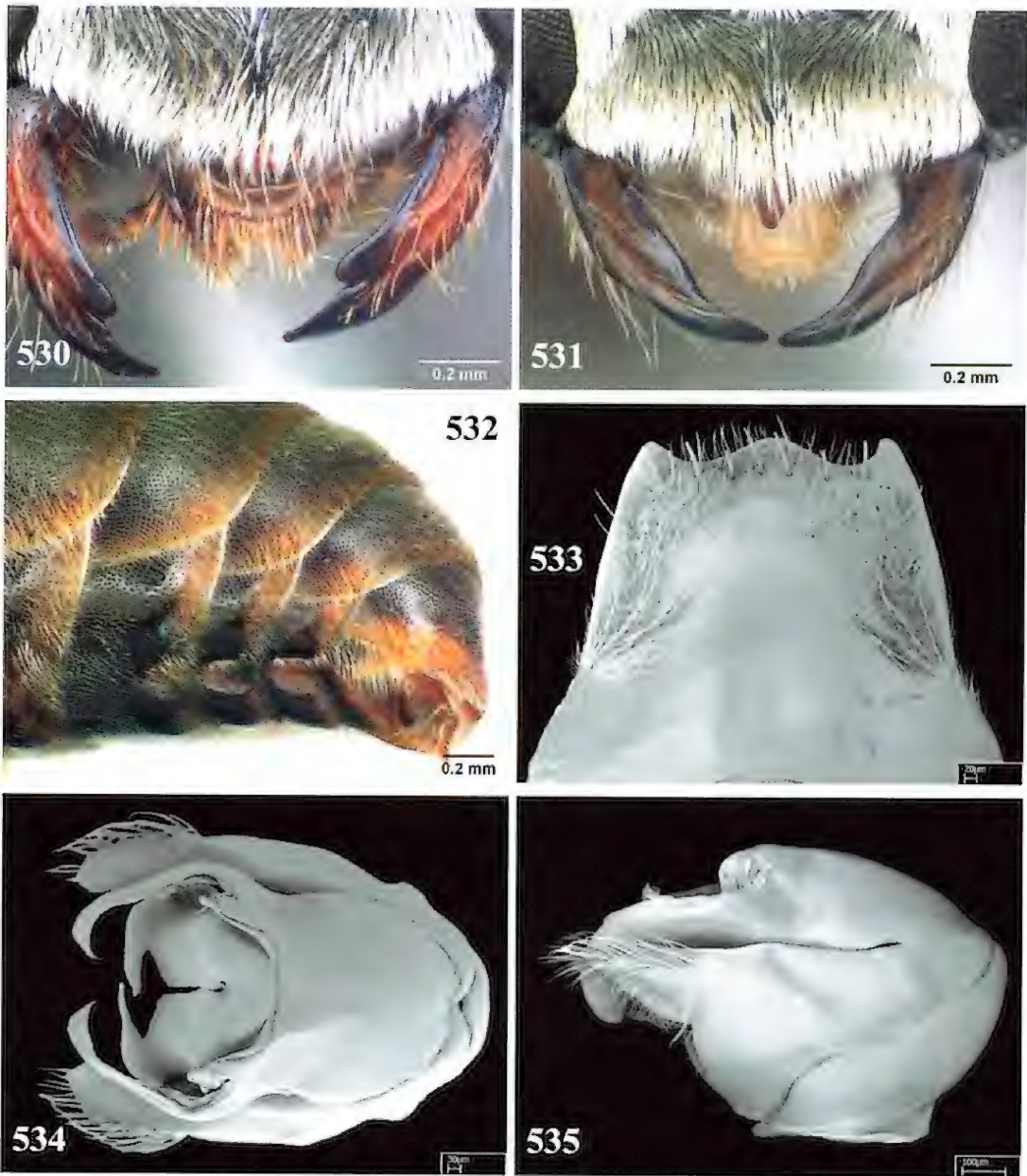
### *Pison impressiventre* Pulawski, species nova

Figures 530–536.

**NAME DERIVATION.**— *Impressiventre*, a neuter adjective, derived from two Latin words, *impressus*, impressed, and *venter*, gaster; with reference to the structure of male sterna.

**RECOGNITION.**— *Pison impressiventre* has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, setae of terga golden or with golden tinge, appressed on tergum I. The female is largely unspecialized: it has a well-defined middle clypeal lobe, with an obtusely angulate lamella (less projecting than in *P. protrudens*); the clypeal surface not concave dorsal of the lamella; the punctures of the upper frons and mesopleuron less than one diameter apart; the gena punctate and setose on both side of the oral fossa, with no psammophore, the setae of the lower gena erect, slightly sinuous, about  $1.3 \times$  as long as midocellar diameter; the ocellocular distance equal to  $1.1\text{--}1.5 \times$  the hindocellar diameter, the distance between hindocelli equal to  $1.2\text{--}1.3 \times$  the hindocellar diameter; tergum VI without median carina; sterna III and IV punctate throughout. It shares with *P. decipiens* the presence of a preapical tooth on the trimmal mandibular carina (Fig. 530). *Pison translucens* differs in lacking the preapical mandibular tooth and in having the clypeal lamella slightly broader (compare Figs. 530 and 1126); also, the ocellocular distance is  $0.9\text{--}1.1 \times$  midocellar diameter in *P. translucens*, but  $1.1\text{--}1.5$  in *P. impres-*





FIGURES 530-535. *Pison impressiventris* Pulawski, sp. nov. (530) Female clypeus and mandibles; (531) Male clypeus and mandibles; (532) Apical gastral segments of male in oblique lateral view; male: (533) Sternum VIII (ventral surface); (534) Genitalia in dorsal view; (535) Genitalia in lateral view.

*siventre*. The females of *P. decipiens* and *P. impressiventre* are almost identical morphologically, and they can best be recognized by association with topotypical males. The most reliable recognition character is the coloration of the tergal setae, which are all silvery in *P. decipiens*, but golden or with golden tinge in *P. impressiventre*. Somewhat helpful is the color of the gaster, all black (except for the apical depressions) in *P. impressiventre*, and all or partly ferruginous basally in several *P. decipiens*. In addition, *P. impressiventre* is known from the Northern Territory and Western Australia, whereas *P. decipiens* occurs not only there, but also in New South Wales, South Australia, and Queensland.

The male is easily recognized by its unique, round posteromedian impressions on sterna IV-VI (Fig. 532); the impressions are minutely punctate, whereas the adjacent preapical portions of sterna are unsculptured. In addition, the apical margin of sternum VIII is at least minimally convex mesally, combined with the acute apicolateral corner (Fig. 533). *Pison decipiens* is nearly identical but the sterna have no posteromedian impressions and the apical margin of sternum VIII is not convex mesally.

**DESCRIPTION.**—Frons dull, with punctures less than one diameter apart. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures less than one diameter apart; interspaces unsculptured, shiny. Tegula enlarged. Mesopleural punctures well defined, less than one diameter apart; interspaces at center with sparse, microscopic punctures. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate and also finely, obliquely ridged on at least part of surface; posterior surface conspicuously, transversely ridged, punctate between ridges. Punctures of tergum I fine, less than one diameter apart. Sternum II punctate throughout.

Setae silvery on head, thorax, and propodeum, golden or with golden tinge on terga, forming setal fasciae on apical depressions; frons with erect setae and also with patch of appressed, dorso-laterally oriented setae on each side below midocellus; scutum with sparse, erect setae; lower gena with erect, slightly sinuous setae about  $1.3 \times$  as long as midocellar diameter; tergum I with appressed setae only; setae completely concealing integument on clypeus except lamella.

Head, thorax, and propodeum black; mandible black basally, ferruginous subapically, dark brown apically; scape ferruginous ventrally in many males, flagellum ferruginous to brown ventrally (apex black) in many females and most males. Fore- and midfemora black, ferruginous apically (largely so in male); hindfemur varying from all black to all ferruginous in female, ferruginous in male; tibiae and tarsi ferruginous or female fore- and midtibiae partly black. Gaster black, apical depressions of terga ferruginous or brown, sternum VIII of male ferruginous (at least partly so).

♀.—Upper interocular distance equal to  $0.92\text{--}0.96 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.94 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 530). Dorsal length of flagellomere I  $2.0\text{--}2.2 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Mandible: trimmal carina with tooth at about two thirds of length. Length 7.6–9.8 mm; head width 2.3–3.1 mm.

♂.—Upper interocular distance equal to  $0.96\text{--}1.00 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.5 \times$  hindocellar diameter; eye height equal to  $0.98\text{--}1.00 \times$  distance between eye notches. Free margin



of clypeal lamella acutely angulate (Fig. 531). Dorsal length of flagellomere I  $1.7\text{--}1.8 \times$  apical width, of flagellomere X  $1.1\text{--}1.2 \times$  apical width. Sterna IV-VI with unsculptured, shiny zone anterior of apical depression, with round apicomedian impressions (Fig. 532) that are minutely punctate; sternum VII densely, finely punctate; sternum VIII with unsculptured swelling at about midlength, finely, densely punctate between swelling and apical margin; apical margin shallowly, broadly emarginate, convex medially, apicolateral angle well defined (Fig. 533). Genitalia: Figs. 534, 535. Length 6.5–8.4 mm; head width 1.9–2.7 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 536).— Northern Territory, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA: Western Australia:** Great Northern Highway at  $23^{\circ}02.6'S$   $118^{\circ}50.2'E$ , 23 Apr – 6 May 2003, M.E. Irwin and F.D. Parker (ANIC).

**PARATYPES:** **AUSTRALIA: Northern Territory:** 76.9 km NNE Lajamanu at  $17^{\circ}14'30''S$   $130^{\circ}54'14''E$ , 11–17 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC); Native Gap 15 km S Alleron at  $22^{\circ}49'S$   $133^{\circ}25'E$ , 11 Apr 1981, M. Malipatil (1 ♀, NTM); Renner Springs, 25 Oct 1971, C.G. Roche (1 ♂, CAS); West MacDonnell National Park ca 3 km W road to Simpson Gap at  $23^{\circ}41.8'S$   $133^{\circ}41.7'E$ , Ch.M. Palmer, 27 Nov – 27 Dec 2006 (1 ♀, CAS; 1 ♀, NTM), 27 Aug – 27 Sept 2007 (1 ♀, NTM). **Western Australia:** M.E. Irwin and F.D. Parker collectors for all following records except as indicated: Balgo Hills, no date, M. Golding (1 ♂, ANIC); 10 km W Cobra Station at  $24^{\circ}10.2'S$   $116^{\circ}23.0'E$ , 26 Apr – 10 May 2003 (11 ♀, CAS; 22 ♂, USU); Great Northern Highway at  $23^{\circ}02.6'S$   $118^{\circ}50.2'E$  (3 ♂, CAS); Great Northern Highway 82 km S Karijini Drive at  $22^{\circ}07.3'S$   $119^{\circ}05.5'E$ , 23 Apr – 16 May 2003 (1 ♀, ANIC; 1 ♀, 4 ♂, CAS; 6 ♀, USU); Hamersley Station at  $22^{\circ}29'10''S$   $117^{\circ}41'28''E$ , 22–27 Sept 2005, CVA [= Conservation Volunteers Australia] (1 ♀, AMS); Karijini National Park at  $22^{\circ}25.6'S$   $118^{\circ}23.7'E$ , 21–23 Apr and 23 Apr – 4 May 2003 (2 ♂, ANIC), at  $22^{\circ}26.3'S$   $118^{\circ}22.9'E$ , 23 Apr – 4 May 2003, M.E. Irwin and F.D. Parker (1 ♀, CAS), at  $22^{\circ}28.4'S$   $118^{\circ}32.6'E$ , 23 Apr – 4 May 2003 (26 ♀, 18 ♂, ANIC; 13 ♀, CAS), at  $22^{\circ}28.7'S$   $118^{\circ}32.3'E$ , 23 Apr – 4 May 2003 (1 ♂, ANIC; 5 ♀, USU), at  $22^{\circ}28.8'S$   $118^{\circ}21.6'E$ , 21 Apr 2003 (1 ♂, ANIC; 1 ♀, USU), at  $22^{\circ}29.5'S$   $118^{\circ}30.1'E$ , 21–23 Apr 2003 (1 ♀, USU), and at  $22^{\circ}34.5'S$   $118^{\circ}30.2'E$ , 22–23 Apr 2003 (2 ♂, ANIC; 1 ♀, USU); Kennedy Range National Park at  $24^{\circ}38.7'S$   $115^{\circ}10.7'E$ , 26 Apr – 10 May 2003 (2 ♀, 1 ♂, ANIC); 11 km SW Marble Bar at Brockman Creek at  $21^{\circ}09.0'S$   $119^{\circ}51.7'E$ , 2–14 May 2003 (3 ♂, ANIC); 63 km E Marble Bar at  $21^{\circ}13.0'S$   $120^{\circ}20.2'E$ , 2–14 May 2003 (1 ♂, ANIC; 1 ♀, CAS); 104 km E Marble Bar at  $21^{\circ}19.1'S$   $120^{\circ}40.3'E$ , 2–15 May 2003 (1 ♂, ANIC; 1 ♀, CAS); 133 km E Marble Bar and 17 km E Woodstock station at  $21^{\circ}41.6'S$   $119^{\circ}04.8'E$ , 3–16 May 2003 (9 ♀, 12 ♂, CAS); Meekatharra-Billiluna Pool, Apr 1930 – Aug 1931, Canning Stock Rte. Exped. (2 ♂, SAM); Mount Augustus National Park at  $24^{\circ}18.0'S$   $116^{\circ}47.6'E$  (1 ♀, 3 ♂, USU) and  $24^{\circ}21.7'S$   $116^{\circ}50.2'E$ , 7–9 May 2003 (1 ♀, ANIC; 3 ♀, CAS); Nanutarra - Wittenoom road at  $22^{\circ}26'8''S$   $117^{\circ}49'56''E$ , 22–27 Sept 2005, CVA [= Conservation Volunteers Australia] (2 ♀, AMS); 158 km S Newman (= 9 km N Kumarina Roadhouse) at  $24^{\circ}37.8'S$   $117^{\circ}36.8'E$  (correctly  $119^{\circ}36.8'E$ ), 7–18 May 2003 (8 ♀, ANIC); 47 km S Pardoo Roadhouse on Shay Gap Road at  $20^{\circ}22.7'S$   $120^{\circ}01.3'E$ , 1–14 May 2003 (1 ♀, 6 ♂, CAS; 2 ♀, USU); 80 km S Pardoo Roadhouse on Shay Gap Road at  $20^{\circ}28.3'S$   $120^{\circ}10.0'E$ , 5 Jan – 14 May 2003 (5 ♂, ANIC; 13 ♀, USU); Serpentine Falls in Darling Ranges, 20 Jan 1971, G.A. Holloway (1 ♀, AMS); in site Plb94 at  $22^{\circ}15.04'S$   $117^{\circ}53.36'E$ , M. Elliott (1 ♂, AMS).



FIGURE 536. Collecting localities of *Pison impressiventre* Pulawski, sp. nov.

*Pison incurvatum* Pulawski, species nova

Figures 537-540.

**NAME DERIVATION.**—*Incurvatus* (neuter: *incurvatum*) is a Latin perfect passive participle of the verb *incurvare*, meaning *curved*, *bent*; with reference to the shape of the female clypeus.

**RECOGNITION.**—*Pison incurvatum* has two submarginal cells, the second cell short (its posterior margin is  $1.2-1.5 \times$  height), the tegula finely punctate throughout and in some wing positions completely covering the humeral plate. The male is unknown. The female can be recognized by the unique shape of the clypeus whose lamella is bent posteriorly and forms an angle with the more dorsal part (Figs. 537, 538). Unlike *P. aberrans*, the dorsal length of flagellomere II is  $2.1 \times$  the apical width (rather than  $1.3-1.6$ ). Additionally, and in contrast to *Pison bicellulare*, the scutum has short longitudinal ridges adjacent to its hindmargin. The body is either nearly all black or (in specimens from Western Australia) the legs are ferruginous

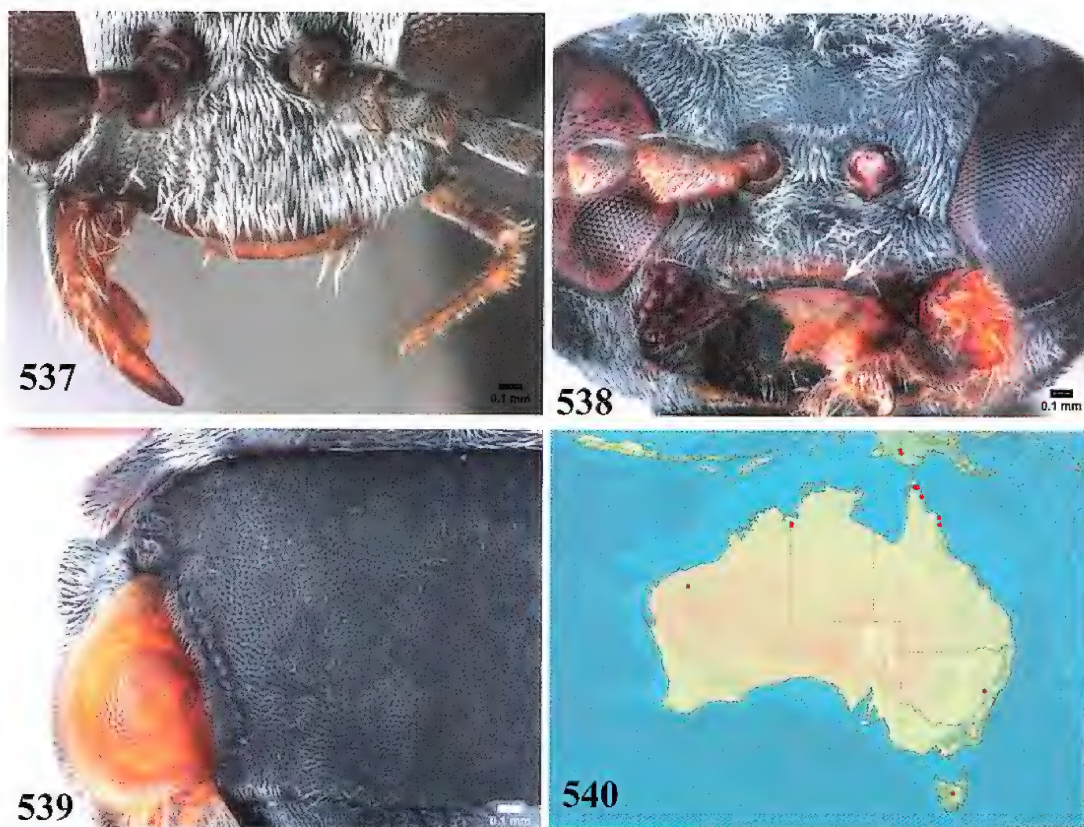
**DESCRIPTION.**—Frons dull, microscopically finely punctate, punctures less than one diameter apart, middle supraantennal carina at most slightly longer than midocellar diameter (mostly shorter or absent). Distance between antennal socket and orbit slightly less than socket width. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum with U-shaped emargination. Anteromedian pronotal pit transversely elongate, about  $4 \times$  as long as midocellar diameter. Scutum foveate along flange, with short longitudinal ridges adjacent to posterior margin, flange slightly extending beyond scutum posterior margin; scutal punctures minute, less than one diameter apart (Fig. 539). Scutellum with foveate sulcus along anterior margin. Tegula enlarged, finely punctate throughout (Fig. 539), fully covering humeral plate in some wing positions. Mesopleural punctures fine, averaging about one diameter apart near center; ill-defined omaulus present in some specimens. Postspiracular carina present, about twice as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleuron minutely punctate, metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum regularly obliquely ridged (transversely so in posterior half or so in some specimens), ridges becoming markedly larger near junction with longitudinal lateral carina, median sulcus absent in some specimens; side minutely punctate, in most specimens also ridged (at least anterodorsally); posterior surface with conspicuous, transverse ridges. Forewing with two submarginal cells; second submarginal cell short (length of posterior margin  $1.2-1.5 \times$  its height). Hindcoxa dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I minute, averaging about one diameter apart (some punctures up to two diameters apart). Sterna minutely punctate throughout.

Setae silvery, appressed on postocellar area, gena, thorax, forecoxal venter, femoral venters, and tergum I, variously oriented on upper frons (upper frons largely asetose in some specimens); largely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body in most specimens black, mandible ferruginous mesally, mid- and hindtibial spurs black. In specimens from Western Australia the legs are all ferruginous and the mid- and hindtibial spurs are whitish.

♀.—Upper interocular distance equal to  $0.95-0.97 \times$  lower interocular distance; ocellocular distance equal to  $0.7-0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.3 \times$  hindocellar diameter; eye height equal to  $1.04-1.10 \times$  distance between eye notches. Apical portion of clypeal lamella bent posteriorly, forming angle with more dorsal part (Figs. 537, 538). Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width. Mandible: trimmal carina with evanescent preapical tooth, with small incision at about two thirds of length. Length 4.5-6.3 mm; head width 1.1-1.6 mm.





FIGURES 537-539. *Pison incurvatum* Pulawski, sp. nov., female. (537) Clypeus and mandible in frontal view; (538) Clypeus obliquely from below (arrow shows bent posteriorly apical part of clypeal lamella); (539) Tegula and adjacent scutum.

FIGURE 540. Collecting localities of *Pison incurvatum* Pulawski, sp. nov.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 540).—New South Wales, Northern Territory, Queensland, Tasmania, Western Australia, and also the island of New Guinea.

**RECORDS**.—**HOLOTYPE**: ♀, **AUSTRALIA: Queensland**: Heathlands at 11°45'S 142°35'E 18 Sept –21 Oct 1992, P. Zborowski and T. Weir (ANIC).

**PARATYPES**: **AUSTRALIA: New South Wales**: Dunns Swamp, 13 Nov 1982, N.W. Rodd (1 ♀, AMS). **Northern Territory**: Keep River National Park at 15°44'17"S 129°06'55"E, 7-8 June 2001, M.E. Irwin, F.D. Parker, and Ch. Lambkin (1 ♀, 1 ♂, CAS), at 15°45'30"S 129°06'28"E, 3-17 June 2001, E.T. Weir, K. Pullen, and P. Bouchard (3 ♀, ANIC), 6-9 June 2001, Ch. Lambkin, M.E. Irwin, and F.D. Parker (3 ♀, CAS), and at 15°55'17"S 129°03'31"E, 2-10 June 2001, M.E. Irwin, F.D. Parker, and Ch. Lambkin (1 ♀, CAS). **Queensland**: Cockatoo Creek crossing 17 km NW Heathlands at 11°39'S 142°27'E, 22 Mar – 25 Apr 1992, T. McLeod (1 ♀, CAS); Gunshot Creek 13 km NW Heathlands Homestead at 11°43'S 142°28'E, 20 Mar 1992, G. Daniels and M.A. Schneider (1 ♀, QMB); Heathlands at 11°45'S 142°35'E, June – 25 July 1992, P. Zborowski and E.S. Nielsen (1 ♀, ANIC); 12 km SSE Heathlands at 11°51'S 142°38'E, 22 Mar – 25 Apr 1992, T. McLeod (1 ♀, CAS); 14 km ENE Heathlands at 11°41'S 142°42'E, 19 Mar 1994, P. Zborowski (1 ♀, ANIC); 3 km ENE Mount Tozer at 12°44'S 143°14'E, 28 June – 4 July 1986, J. C. Cardale (1 ♀, ANIC); 3 km NE Mount Webb at 15°03'S 145°09'E, 1-30 Oct 1980, J.C. Cardale (1 ♀, ANIC); Shiptons Flats at 15°47'S 145°14'E, 17-19 Oct 1980, J.C. Cardale (1 ♀, ANIC). **Tasmania**: 9 km SE Mienna, 10 Jan 1992, D.W. Webb (1 ♀, UCD). **Western Australia**: Hamersley Station at 22°29.10'S 117°41.28'E, 30 Sept – 5 Oct

2004, CVA [= Conservation Volunteers Australia] (3 ♀, AMS); Nanutarra-Wittenoom road at 22°26.8'S 117°49.56'E, CVA [= Conservation Volunteers Australia], 30 Sept – 5 Oct 2004 (1 ♀, AMS), 18–23 Nov 2004 (1 ♀, CAS), and 28 Oct – 2 Nov 2005 (1 ♀, AMS).

INDONESIA: **Western Papua** (= Indonesian New Guinea): 11 km S Bupul at 7°39'S 140°53'E (2 ♀, RMNH); Erambu 80 km NE Merauke (1 ♀, BISH).

### *Pison infumatum* Turner

Figures 541–546.

*Pison infumatum* Turner, 1908:510, ♀. Lectotype: ♀, Australia: Northern Territory: Darwin (BMNH), **present designation**, examined. – Turner, 1916b:597 (in key to Australian *Pison*), 605 (recognition character); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:260 (in catalog of Australian Sphecidae).

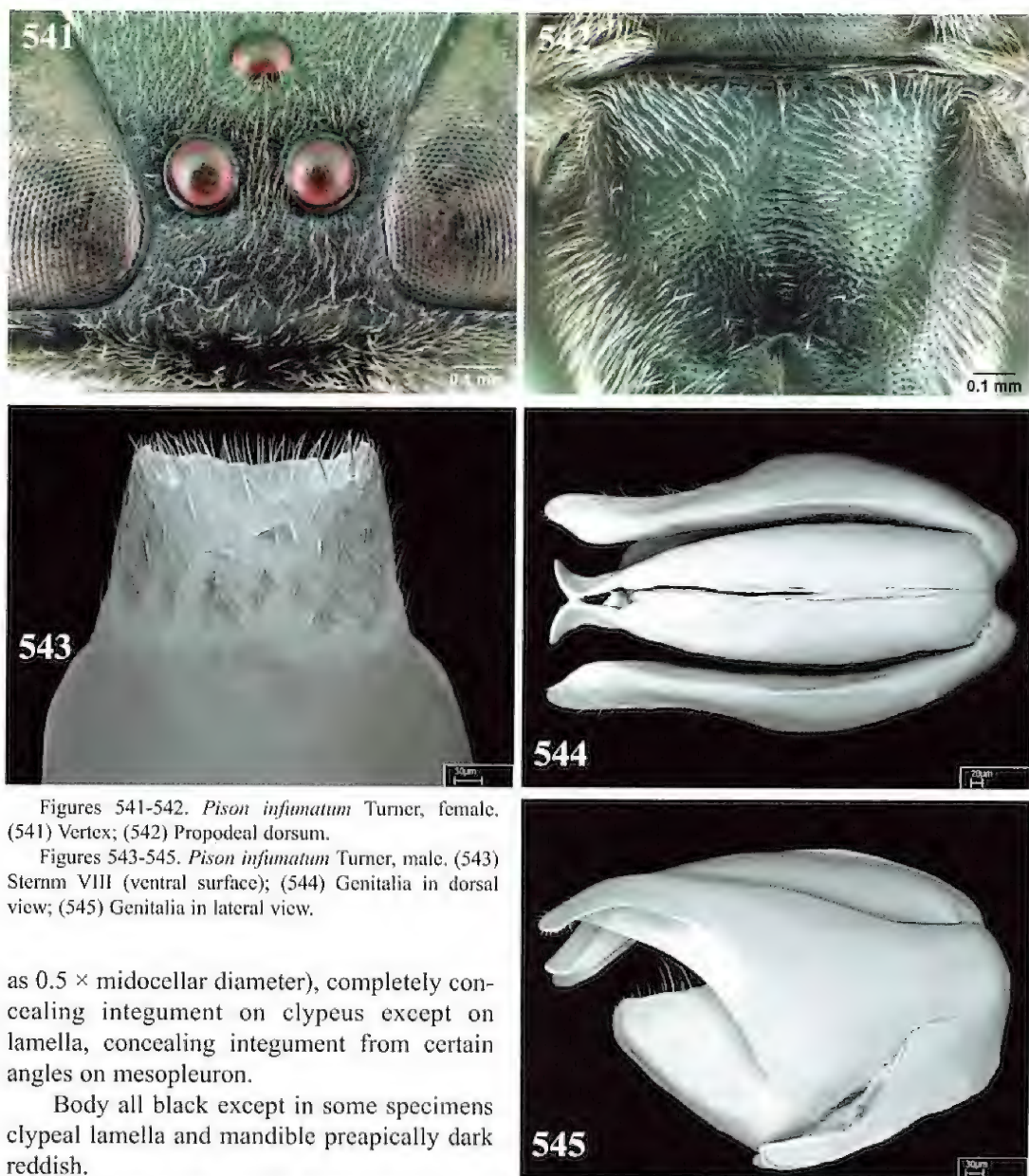
**LECTOTYPE DESIGNATION.**– Turner (1908) did not mention the number of the specimens examined in the original description of *Pison infumatum*. I have designated as the lectotype of this species the only specimen, a female, present at The Natural History Museum, London.

**RECOGNITION.**– *Pison infumatum* is an all black, small species (length 5.5–7.0 mm in female, 5.1–6.0 mm in male). It has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. It is characterized by the ocellular distance  $0.3\text{--}0.5 \times$  as great as the hindocellar diameter in the female (Fig. 541) and  $0.4\text{--}0.9 \times$  in the male, the propodeum without the longitudinal carina separating the side from the dorsum and posterior surface, and the propodeal dorsum minutely punctate, punctures averaging 2–3 diameters apart (Fig. 542), in most specimens without ridges except ridged adjacent to the anterior margin, with minute, inconspicuous ridges in some specimens, with the interspaces unsculptured, shiny. *Pison nitens* is similar, but *P. infumatum* has the frons with an ill-defined protuberance (rather than well defined), the pronotal collar not swollen (rather than swollen), the punctures of the scutum, mesopleuron, and tergum I minute (rather than well defined), the clypeal lip of the female evenly, prominently arcuate (rather than with a small median projection), and the female mandible unidentate apically (rather than tridentate apically).

**DESCRIPTION.**– Frons minutely punctate, punctures about one diameter apart, interspaces dull, microsculptured. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Propleural punctures up to several diameters apart at center. Scutum not foveate along flange, without ridges adjacent to posterior margin; scutal punctures minute, about one to two diameters apart, interspaces microsculptured. Mesopleural punctures minute, less than one diameter apart adjacent to episternal sulcus, about two diameters apart posteriorly. Postspiracular carina present, about as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum punctate (Fig. 542), most punctures 2–3 diameters apart (interspaces unsculptured, shiny), with middle carina in at least anterior quarter, without median depression in anterior third, with fine, short, oblique ridges emerging from midline in at least posterior two thirds, with minute, inconspicuous ridges on most of its surface in specimen from Keep River National Park, Northern Territory; side punctate, interspaces in some specimens merging into minute ridges anterodorsally; posterior surface transversely ridged ventrally, punctate dorsally. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I minute, 2–4 diameters apart on disk; interspaces with evanescent microsculpture. Sterna finely punctate throughout.

Setae silvery, appressed on upper frons, scutum, and tergum I, suberect on lower gena (as long





Figures 541-542. *Pison infumatum* Turner, female. (541) Vertex; (542) Propodeal dorsum.

Figures 543-545. *Pison infumatum* Turner, male. (543) Sternum VIII (ventral surface); (544) Genitalia in dorsal view; (545) Genitalia in lateral view.

as  $0.5 \times$  midocellar diameter), completely concealing integument on clypeus except on lamella, concealing integument from certain angles on mesopleuron.

Body all black except in some specimens clypeal lamella and mandible preapically dark reddish.

♀.— Upper interocular distance equal to  $0.60-0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.3-0.5 \times$  hindocellar diameter; distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter (Fig. 541); eye height equal to  $1.02-1.06 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate, exactly as in *P. westwoodii* (see Fig. 1183). Dorsal length of flagellomere I  $2.7-2.8 \times$  apical width, of flagellomere IX  $1.5 \times$  apical width. Mandible: trimmal carina with minute incision at about two thirds of length. Length 5.5-7.0 mm; head width 1.7-1.9 mm.

♂.— Upper interocular distance equal to  $0.64-0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.4-0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hind-

ocellar diameter; eye height equal to  $1.02 \times$  distance between eye notches. Free margin of clypeal lamella slightly sharper than in Australian *P. westwoodii* (see Fig. 1184). Dorsal length of flagellomere I  $2.0\text{--}2.1 \times$  apical width, of flagellomere X  $1.1\text{--}1.2 \times$  apical width. Sternum VIII broadly emarginate apically (Fig. 543). Genitalia: Figs. 544, 545. Length 5.1–6.0 mm; head width 1.4–1.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 546).—Northern parts of Northern Territory and of Western Australia, also eastern Queensland.

**RECORDS.**— **AUSTRALIA: Northern Territory:** Darwin (1 ♀, BMNH, lectotype of *Pison infumatum*), Gregory National Park at  $15^{\circ}36'43''\text{S}$   $130^{\circ}24'08''\text{E}$  (1 ♀, ANIC; 1 ♂, CAS), Gregory National Park near Victoria River Roadhouse at  $15^{\circ}36.8'\text{S}$   $131^{\circ}08.7'\text{E}$  (2 ♀, CAS), Gungaree in Kakadu National Park (1 ♀, NTM), Howard Spring Nature Reserve at  $12^{\circ}27.3'\text{S}$   $131^{\circ}03.1'\text{E}$  (1 ♂, CAS), 91 km SW Kalkarindji at  $17^{\circ}40'36''\text{S}$   $130^{\circ}00'34''\text{E}$  (1 ♀, ANIC), Keep River National Park at  $15^{\circ}57'33''\text{S}$   $129^{\circ}01'44''\text{E}$  (1 ♀, CAS). **Queensland:** Arcadia on Magnetic Island at  $19^{\circ}09'\text{S}$   $146^{\circ}52'\text{E}$  (2 ♂, ANIC), Balgal Beach 51 km NW Townsville at  $19^{\circ}02.5'\text{S}$   $146^{\circ}25.2'\text{E}$  (2 ♀, 1 ♂, CAS), 3 km W Batavia Downs at  $12^{\circ}40'\text{S}$   $142^{\circ}39'\text{E}$  (1 ♀, 1 ♂, ANIC), Biggenden: Geissler's scrub (1 ♀, ANIC), Bowling Green Bay National Park at  $19^{\circ}26.0'\text{S}$   $146^{\circ}56.7'\text{E}$  (41 ♀, CAS) and  $19^{\circ}26.6'\text{S}$   $146^{\circ}56.7'\text{E}$  (1 ♀, CAS), Brisbane: Indooroopilly (1 ♂, BMNH), Burdekin River 20 km ENE Charters Towers at  $20^{\circ}00.1'\text{S}$   $146^{\circ}26.3'\text{E}$  (1 ♀, 1 ♂, CAS), Claudie River near Mount Lamond (1 ♂, AMS), Coen: Mount White at  $13^{\circ}58'\text{S}$   $143^{\circ}11'\text{E}$  (1 ♀, QMB), Granite Gorge ca 6 km SW Mareeba (1 ♀, CAS), Hann River at  $15^{\circ}11'\text{S}$   $143^{\circ}52'\text{E}$  (1 ♀, ANIC), Heathlands at  $11^{\circ}45'\text{S}$   $142^{\circ}35'\text{E}$  (2 ♀, ANIC), 12 km SSE Heathlands at  $11^{\circ}51'\text{S}$   $142^{\circ}38'\text{E}$  (1 ♀, ANIC), Iron Range National Park (1 ♂, ANIC), Mossman (1 ♀, 1 ♂, CAS), 3 km SSW Mount Baird at  $15^{\circ}10'\text{S}$   $145^{\circ}07'\text{E}$  (1 ♂, ANIC), 3.5 km SSW Mount Baird at  $15^{\circ}38'\text{S}$   $145^{\circ}15'\text{E}$  (1 ♀, ANIC), 11 km ENE Mount Tozer at  $12^{\circ}43'\text{S}$   $143^{\circ}18'\text{E}$  (2 ♂, ANIC), Mount Webb National Park at  $15^{\circ}04'\text{S}$   $145^{\circ}07'\text{E}$  (1 ♀, ANIC), Paluma Range National Park at  $18^{\circ}51.6'\text{S}$   $146^{\circ}07.6'\text{E}$ , altitude ca 50 m (1 ♀, CAS), 2 km N Rokeby at  $13^{\circ}39'\text{S}$   $142^{\circ}40'\text{E}$  (1 ♀, 1 ♂, ANIC), 11 km S Townsville at  $19^{\circ}21.8'\text{S}$   $146^{\circ}53.2'\text{E}$  (2 ♀, CAS), 37 km S Townsville at  $19^{\circ}22.4'\text{S}$   $141^{\circ}01.7'\text{E}$  (1 ♀, CAS). **Western Australia:** 12 km S Kalumburu Mission at  $14^{\circ}25'\text{S}$   $126^{\circ}38'\text{E}$  (1 ♀, ANIC), Lone Dingo in Mitchell Plateau at  $14^{\circ}35'\text{S}$   $125^{\circ}45'\text{E}$  (2 ♀, ANIC), Mining Camp in Mitchell Plateau at  $14^{\circ}49'\text{S}$   $125^{\circ}50'\text{E}$  (1 ♀, ANIC), Synnot Creek at  $16^{\circ}31'\text{S}$   $125^{\circ}16'\text{E}$  (1 ♀, ANIC).



FIGURE 546. Collecting localities of *Pison infumatum* Turner.

### *Pison inusitatum* Pulawski, species nova

Figures 547–554.

**NAME DERIVATION.**—*Inusitatum* is a Latin neuter adjective meaning *rare, extraordinary, new*; with reference to the unusual sternum VIII in the male of this species.

**RECOGNITION.**—The male of *Pison inusitatum* (the female is unknown) is easily recognized by its unusually broad, apically rounded sternum VIII (Fig. 551). Subsidiary recognition features are: mesopleural punctures well defined, averaging about one diameter apart (Fig. 550), and the propodeum without a longitudinal carina separating the dorsum and posterior surface from the side.

**DESCRIPTION.**—Frons finely, shallowly punctate, punctures shallow, averaging about one diameter apart; interspaces conspicuously microsculptured, dull (Fig. 548). Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Scutum foveate along flange, without longitudinal ridges adjacent to





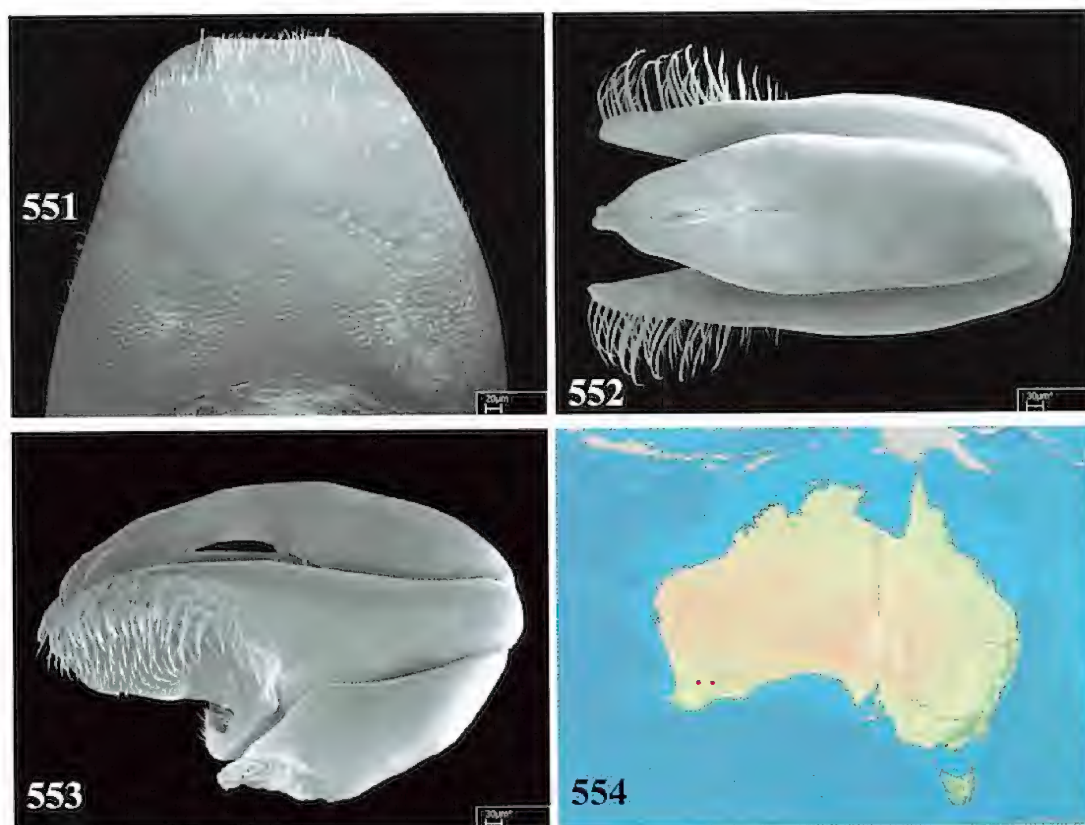
FIGURES 547-550. *Pison inusitatum* Pulawski, sp. nov., male. (547) Clypeus and mandibles; (548) Upper frons; (549) Tegula and adjacent scutum; (550) Mesopleuron.

posterior margin; scutal punctures fine, averaging 1-3 diameters apart; interspaces microareolate, dull. Tegula enlarged, in holotype with longitudinal carina adjacent to scutal flange (Fig. 549). Mesopleural punctures well defined, averaging about one diameter apart; interspaces microsculptured, dull (Fig. 550). Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum punctate and obliquely ridged (ridges conspicuous at base, gradually evanescent); side punctate and ridged (ridges well defined dorsally, evanescent ventrally); posterior surface finely punctate and inconspicuously, transversely ridged. Posteroventral forefemoral surface with relatively well-defined punctures less than to about one diameter apart. Punctures of tergum I fine, anterior to apical depression about 1-2 diameters apart. Punctures of sterna II-IV fine, several diameters apart (except laterally).

Setae silvery, on upper frons erect and longer than midocellar diameter (some setae  $2.0 \times$  midocellar diameter), on postocellar area appressed, on scutum erect, about  $0.3 \times$  midocellar diameter, on lower gena erect, straight, up to  $1.0 \times$  midocellar diameter, on tergum I appressed, on clypeus not completely concealing integument. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Unknown.



FIGURES 551-553. *Pison inusitatum* Pulawski, sp. nov., male. (551) Sternum VIII (ventral surface); (552) Genitalia in dorsal view; (553) Genitalia in lateral view.

FIGURE 554. Collecting localities of *Pison inusitatum* Pulawski, sp. nov.

♂.— Upper interocular distance equal to  $0.76-0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.4-1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5-1.8 \times$  hindocellar diameter; eye height equal to  $0.94-0.98 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 547). Dorsal length of flagellomere I  $2.1-2.2 \times$  apical width, of flagellomere X  $1.0-1.1 \times$  apical width. Sternum VIII unusually broad, apical margin rounded (Fig. 551). Genitalia: Figs. 552, 553. Length 5.3-6.8 mm; head width 1.5-1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 554).— Known from two localities in southwestern part of Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: Western Australia: 75 km WSW Lake Cronin at  $32^{\circ}23'S$   $119^{\circ}46'E$ , 19-26 Sept 1978, T.F. Houston (WAM).

PARATYPE: AUSTRALIA: Western Australia: 14 km NE Kondinin at  $32^{\circ}22'S$   $118^{\circ}18'E$ , 8 Oct 1981, I.D. Naumann and J.C. Cardale (1 ♂, ANIC).

### *Pison kalbarri* Pulawski, species nova

Figures 555-556.

**NAME DERIVATION.**— Kalbarri is a town in western Australia (and also an aboriginal word of unknown meaning) near which the holotype was collected; a noun in apposition.

**RECOGNITION.**— *Pison kalbarri* is an all black species with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, the tegula partly impunctate and



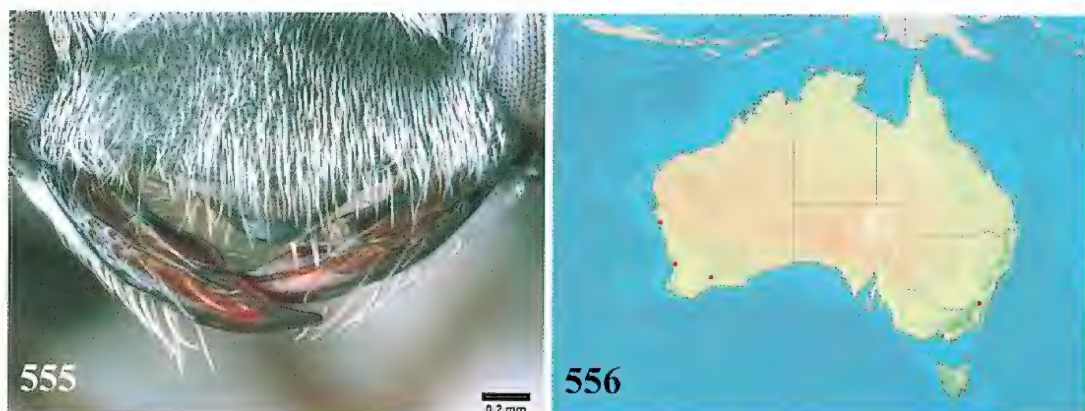


FIGURE 555. *Pison kalbarri* Pulawski, sp. nov., female. (555) Clypeus and mandibles.

FIGURE 556. Collecting localities of *Pison kalbarri* Pulawski, sp. nov.

asetose, and setae appressed on tergum I and sinuous, erect on the lower gena. Furthermore, it has no longitudinal carina separating the propodeal side from the dorsum and the posterior surface, the ocellocular distance in the female equals  $0.8 \times$  hindocellar diameter (the male is unknown), and the gastral setae are silvery. The female is strikingly similar to that of *P. ovale*, but differs in having the clypeal lamella not divided into a ventral and a dorsal part by a transverse sulcus.

**DESCRIPTION.**—Frons dull, punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly shorter than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart; interspaces markedly microsculptured. Tegula slightly enlarged. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina evanescent, as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged; side punctate, interspaces merging into minute ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface closely punctate. Punctures of tergum I about one diameter apart on horizontal part anterior to apical depression. Sterna punctate throughout, about two diameters apart on center of sternum II.

Setae silvery, appressed and also erect on upper frons (erect setae about as long as midocellar width), erect on postocellar area, appressed on scutum and tergum I; on lower gena erect, sinuous, up to  $1.5 \times$  midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible dark reddish apically.

♀.—Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.2 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella roundly triangular (Fig. 555). Dorsal length of flagellomere I  $1.8 \times$  apical width in specimens from Western Australia,  $2.2 \times$  apical width in that from New South Wales, of flagellomere IX  $1.1 \times$  apical width. Mandible: trimmal carina with small incision at about apical two thirds. Length 7.0–7.9 mm; head width 2.3–2.7 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 556).—New South Wales, Western Australia.

**RECORDS.**—HOLOTYPE: ♀, **AUSTRALIA: Western Australia:** 34 km SE Kalbarri at 27°48.3'S 114°26.2'E, 5 Nov 2008, V. Ahrens and W.J. Pulawski (WAM).

**PARATYPES:** **AUSTRALIA: New South Wales:** Whiskers 7 km NW Hoskinstown at 35°24'S 149°23'E, 2 Jan 1993, M.S. Upton (1 ♀, ANIC). **Western Australia:** Frank Hann National Park 32 km E Lake King at 33°04.7'S 120°01.6'E, 30 Nov 2008, D.M. Bray and W.J. Pulawski (1 ♀, CAS); Walyunga National Park 4 km NE Perth, 26-29 Oct 1987, M.E. Irwin (1 ♀, CAS).

***Pison kurandae* Pulawski, species nova**

Figures 557-559.

**NAME DERIVATION.**—*Kurandae* is the Latin genitive case of the place name *Kuranda* in the Far North Queensland, near which the holotype was collected.

**RECOGNITION.**—The female of *Pison kurandae* (the male is unknown) is characterized by the unsculptured and asetose area on each side of the oral fossa, the unsculptured area being delimited externally by a short psammophore. A number of other species share these characteristics, but *P. kurandae* differs from them by the following combination of characters: body all black, with silvery setae; free margin of the clypeal lamella slightly arcuate, with the lateral corner obtusely angulate (Fig. 557); about the posterior half of the tegula unsculptured; propodeum with a longitudinal carina separating the side from the dorsum and the posterior surface; forefemoral venter with a short psammophore.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina slightly expanded ventrally (about as high as  $0.3 \times$  midocellar diameter), joining hypostomal carina. Gena narrow in dorsal view (Fig. 558). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, twice as long as midocellar diameter. Scutum foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, mostly less than one diameter apart, but many punctures on disk one diameter apart. Tegula not enlarged. Mesopleural punctures well defined, nearly contiguous, many interspaces merging into irregular, mainly vertical ridges. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged; side conspicuously, longitudinally ridged dorsally, finer anteroventrally (ridges oriented vertically), and even finer posteroventrally (ridges oriented longitudinally), punctate between ridges; posterior surface reticulate-striate, with several conspicuous ridges radiating up from gastropodeal articulation. Posteroventral forefemoral surface minutely punctate, punctures about one diameter apart. Hindcoxa dorsum with outer margin sharply carinate apically. Outer surface of hindtibia with evanescent spines. Punctures of tergum I, anterior of apical depression, well defined, averaging about one diameter apart. Sterna punctate throughout, apicomedian punctures of sternum II about 1-2 diameters apart.

Setae silvery, appressed on frons (a few setae suberect), on postocellar area, and tergum I; not concealing integument on clypeus. Genal setae: see below. Apical depressions of terga with ill-defined, silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.56 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella slightly arcuate, lateral corner obtusely angulate (Fig. 557). Dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Lower gena, mandibular posterior margin, and





FIGURES 557-558. *Pison kurandae* Pulawski, sp. nov., female. (557) Clypeus and mandibles; (558) Head in dorsal view.

FIGURE 559. Collecting locality of *Pison kurandae* Pulawski, sp. nov.



forefemoral venter with short psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.4 \times$ ,  $1.0 \times$ , and  $0.5 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision at about midlength. Length 6.1 mm; head width 1.8 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 559).— Known from one locality in northeastern Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Queensland: Mareeba Shire: Russett Park near Kuranda, 26 Nov 1987, T.W. Davies (CAS).

### *Pison laeve* F. Smith

Figures 560-570.

*Pison laeve* F. Smith, 1856:317, as ♀ but actually ♂ (as *laevis*, incorrect original termination). Lectotype: ♂, "Georgia": no specific locality, actually island of New Georgia (BMNH), **present designation**, examined. — Cresson, 1862:238 (in catalog of North American Hymenoptera); F. Smith, 1869:291 (in checklist of *Pison*); Patton, 1880:386 (in checklist of North American Larrinae); Kohl, 1885:187 (in checklist of world *Pison*); Cresson, 1887:276 (in catalog of North American Hymenoptera); W. Fox, 1894:471 (in revision of North American Larrinae, original description copied); Dalla Torre, 1897:712 (in catalog of world Hymenoptera, as *leve*); Ashmead, 1899d:251 (in checklist of North American Crabronidae); Harrington, 1902:222 (Canada: Ontario: Ottawa, as *laevis*, certainly in error); Turner, 1916b:628 (bibliographic reference to original description); Krombein in Muesebeck et al., 1951:954 (in catalog of North American Hymenoptera); Krombein, 1958:188 (holotype is a male, not female); Menke, 1968a:7 (tentatively in checklist of New World species of subgenus *Pison*); R. Bohart and Menke, 1976:333 (in checklist of world Sphecidae, probably from New Georgia, Solomon Islands); Krombein, 1979:1641 (origin probably New Georgia, Solomon Islands); Menke, 1988a:90 (origin discussed, diagnostic characters, redescription).

As *Pison glabrum*: Naumann, 1990a:24 (Norfolk Island) and Smithers, 1998:46 (in list of insects of Norfolk Island), **present correction.**

**DESIGNATION OF LECTOTYPE AND ITS ORIGIN.**— F. Smith (1856) did not indicate the number of specimens examined in the original description of *Pison laeve*. One specimen bearing the label “*laevis* Sm., type” is present in The Natural History Museum, London, and I have designated it as the lectotype of this species.

The specimen also bears the label “Georgia”, and this name is given in the original description. Several XIX<sup>th</sup> and early XX<sup>th</sup> centuries North American authors treated it as Georgia, USA, but Bohart and Menke (1976), Krombein (1979), and Menke (1988) suspected that the specimen came from the western Pacific island of New Georgia. In my opinion, the specimen was certainly collected at New Georgia, as it has never been recorded from USA, and particularly because the island of New Georgia is close to the other areas of this species distribution.

**RECOGNITION.**— *Pison laeve* is unique among the Australian species in having a significantly expanded scutal flange, largely covering the tegula (Fig. 563). Subsidiary recognition feature are: ocellocular distance markedly smaller than hindocellar diameter (Fig. 562), tegula all punctate, and the mesopleuron (Fig. 564), propodeal dorsum (Fig. 565), side, and posterior surface shiny, with punctures several to many diameters apart. The body is all black except the mandible is dark reddish preapically.

**COMPARISON WITH *PISON SEYRIGI*.**— *Pison laeve* resembles the Madagascan species *P. seyrigi* Arnold in having an expanded scutal flange. The latter differs from *P. laeve* in having conspicuous, well defined punctures on the frons, scutum, and terga (rather than fine, inconspicuous punctures), erect setae on tergum I and sternum II (rather than appressed ones), and markedly longer setae on the thorax and femora (e.g., scutal setae are  $1.5 \times$  midocellar diameter, rather than  $0.6\text{--}0.7 \times$ ).

**DESCRIPTION.**— Frons dull, conspicuously microareolate, with minute punctures several diameters apart. Distance between antennal socket and orbit slightly smaller than socket width. Gena narrow in dorsal view. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, at most with a few small, short longitudinal ridges adjacent to posterior margin; scutal punctures fine, several diameters apart; interspaces microsculptured, dull. Scutal flange significantly expanded in most specimens, as wide as  $1.2\text{--}1.7 \times$  midocellar diameter, largely covering the tegula (Fig. 563), but as wide as  $1.0 \times$  midocellar diameter and covering about half of the tegula in the lectotype and specimens from Norfolk Island. Tegula finely punctate except for impunctate narrow marginal rim. Mesopleural punctures well defined, several diameters apart (Fig. 564). Postspiracular carina present, about as long as  $1.5 \times$  midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum, side, and posterior surface punctate, punctures several to many diameters apart, fine on dorsum (Fig. 565). Punctures of tergum I minute, several diameters apart. Sternum II finely punctate, punctures sparse mesally, several diameters apart apicomesally.

Setae silvery, suberect on upper frons, erect on scutum, gena, appressed on tergum I, not concealing integument on clypeus in female, concealing in male; setal length slightly less than midocellar diameter on upper frons and scutum, equal to midocellar diameter on lower gena. Apical depressions of terga with ill-defined setal fasciae in most specimens; tergal setae all black in lectotype and specimen from Norfolk Island.

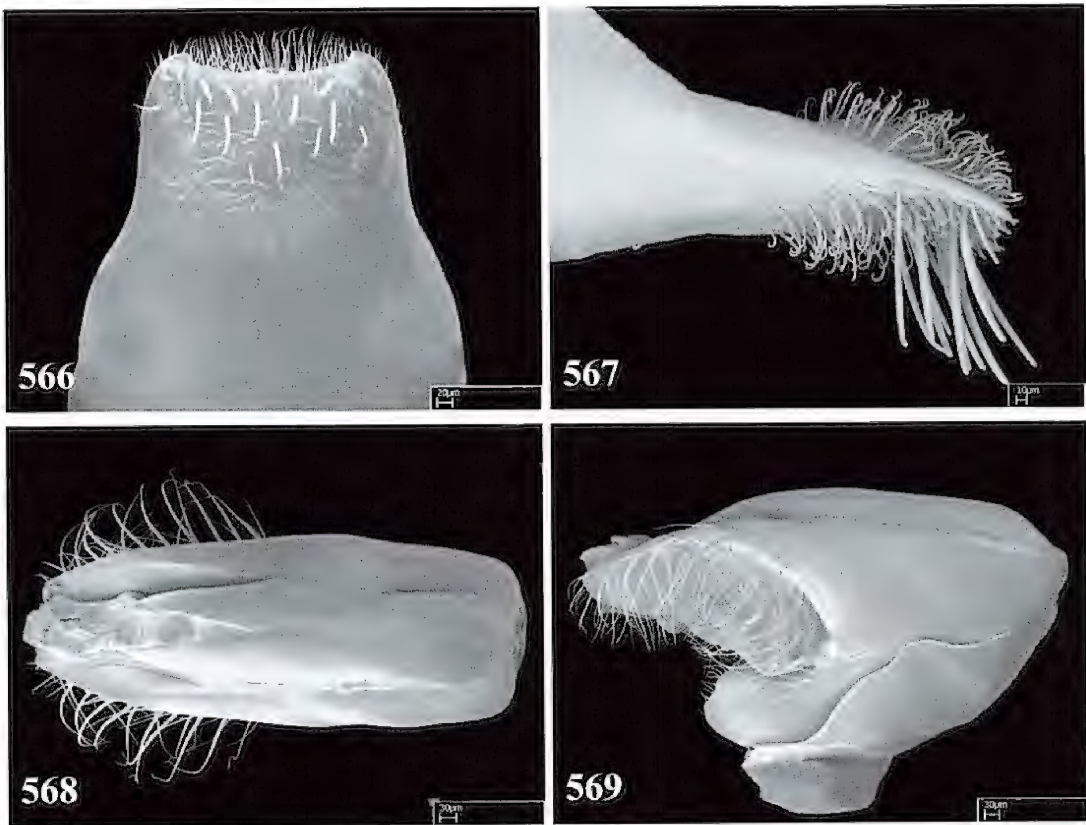
Head, thorax, propodeum, legs, and gaster black, mandible dark reddish preapically.

♀.— Upper interocular distance equal to  $0.46\text{--}0.52 \times$  lower interocular distance; ocellocular distance equal to  $0.1\text{--}0.2 \times$  hindocellar diameter, distance between hindocelli  $0.3\text{--}0.4 \times$  hindocellar diameter (Fig. 562); eye height equal to  $1.04\text{--}1.08 \times$  distance between eye notches. Free margin of





Figures 560-565. *Pison laeve* F. Smith. (560) Female clypeus and mandibles; (561) Male clypeus and mandibles; (562) Female vertex; (563) Left part of female scutum (arrow shows expanded flange); (564) Female mesopleuron; (565) Propodeal dorsum of female.



FIGURES 566-569. *Pison laeve* F. Smith, male. (566) Sternum VIII (ventral surface); (567) Sternum VIII in lateral view; (568) Genitalia in dorsal view; (569) Genitalia in lateral view.

clypeal lamella broadly arcuate (Fig. 560). Dorsal length of flagellomere I  $3.1-3.2 \times$  apical width, of flagellomere IX  $1.6-1.8 \times$  apical width. Mandible: trimmal carina with small incision at about mandible midlength. Length 7.9-9.0 mm; head width 2.0-2.4 mm.

♂.—Upper interocular distance equal to  $0.62-0.64 \times$  lower interocular distance; ocellocular distance equal to  $0.3-0.5 \times$  hindocellar diameter, distance between hindocelli  $0.4-0.7 \times$  hindocellar diameter; eye height equal to  $1.06-1.1 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 561). Dorsal length of flagellomere I  $2.7-2.9 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 566), viewed in profile: Fig. 567. Genitalia: Figs. 568, 569. Length 6.2-6.8 mm; head width 1.8-2.0 mm.

**VARIATION.**—Most specimens have three submarginal cells, but a male from Lamington National Park, Queensland, has only two.

**GEOGRAPHIC DISTRIBUTION** (Fig. 570).—Eastern Australia, Lord Howe Island, Norfolk Island, New Georgia, Papua New Guinea.

**RECORDS.**—**AUSTRALIA:** **Australian Capital Territory:** Black Mountain (1 ♂, ANIC). **New South Wales:** Barrington Tops National Park: upper Williams River (1 ♀, AMS), Bulahdelah (as Bulladellah): O'Sullivan's Gap (1 ♀, AMS), Chichester State Forest at  $32^{\circ}08'S$   $151^{\circ}27'E$  (1 ♀, ANIC), Cockerawoombeeba Creek WNW Ballangry (5 ♀, 1 ♂, AMS), Coocumbac Island Nature Reserve near Taree (1 ♀, ANIC), Dorriggo National Park (6 ♀, 1 ♂, AMS), Harrington: littoral rainforest (2 ♀, AMS), 3 km N Lansdowne near Taree (1 ♂, CAS), Lindfield at  $33^{\circ}46'S$   $151^{\circ}11'E$  (1 ♀, ANIC), Lord Howe Island (1 ♀, ANIC; 1 ♀, SAM), Lord Howe Island at  $31^{\circ}31'37"S$   $159^{\circ}03'58"E$  (6 ♀, 12 ♂, AMS), Lord Howe Island: Dawson's Point Ridge



at 31°30'58"S 159°02'58"E (1 ♀, AMS), Lord Howe Island: Malabar Trail near Neds Beach at 31°31'S 159°04'E (1 ♀, ANIC), Lord Howe Island: Mount Lidgebird foothills (1 ♀, ANIC), Lorient Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (1 ♂, ANIC; 4 ♀, 5 ♂, AMS), Manly: Kangaroo Park (1 ♀, ANIC), Myall Lakes National Park (4 ♀, AMS), Nadgee Nature Reserve: Merrica River (2 ♀, 4 ♂, AMS), Pearl Beach (1 ♀, ANIC), Royal National Park (1 ♀, AMS), Shoalhaven River 30 km W Nowra (1 ♀, AMS), Starrs Creek in Lansdowne State Forest (4 ♀, AMS), Sydney (1 ♀, 1 ♂, BMNH), Sydney: Manly Dam (1 ♀, ANIC), Wilson River Primitive Reserve 15 km NW Bellangry (10 ♀, 2 ♂, AMS), Woronera River at Engadine (2 ♀, AMS). **Norfolk Island:** Filmy Fern Valley at 29°01'S 167°57'E (1 ♀, ANIC), Norfolk Island National Park at 29°01'S 167°56'E (3 ♂, ANIC). **Queensland:** Binna Burra in Lamington National Park (1 ♀, CAS), Brisbane Forest Park at 27°25'S 152°50'E (1 ♀, 1 ♂, MNKB), Bulburin State Forest (1 ♀, QMB), Cairns (1 ♀, BMNH), Cairns District (3 ♀, SAM), Curtain Fig 2 km SSW Yungaburra at 17°17'S 145°34'E (2 ♀, ANIC), Earl Hill N Cairns (1 ♂, ANIC), Eungella at 21°07.6'S 148°29.7'E (10 ♀, CAS), Eungella National Park (1 ♀, QMB; 1 ♀, UCD), Eurimbula National Park: Bustard Beach at 24°10'S 151°52'E (1 ♀, AMS), Lamington National Park at 28°13'S 153°07'E (4 ♀, MNKB), at 28.188°S 153.121°E (6 ♀, 1 ♂, QMB), at 28.192°S 153.124°E (5 ♀, 1 ♂, QMB), at 28.204°S 153.129°E (3 ♀, 1 ♂, QMB), at 28.207°S 153.139°E (1 ♀, QMB), and at 28.212°S 153.141°E (1 ♂, QMB), Mount Glorious at 27°20'07"S 152°45'30"E (1 ♀, MNKB), Paluma, 2900 feet (1 ♀, CAS), Paluma Range National Park at 18°51.6'S 146°07.6'E, alt. ca 50 m (1 ♀, 1 ♂, CAS), Pine Creek 11 km SSE Cairns at 17°00'S 145°50'E (2 ♀, ANIC), Shiptons Flats at 15°47'S 145°14'E (2 ♀, ANIC).

FIGURE 570. Collecting localities of *Pison laeve* F. Smith.



**PAPUA NEW GUINEA: Morobe Province:** Finschhafen (1 ♀, BISH). **SOLOMON ISLANDS: New Georgia island:** no specific locality (1 ♂, BMNH, lectotype of *Pison laeve*).

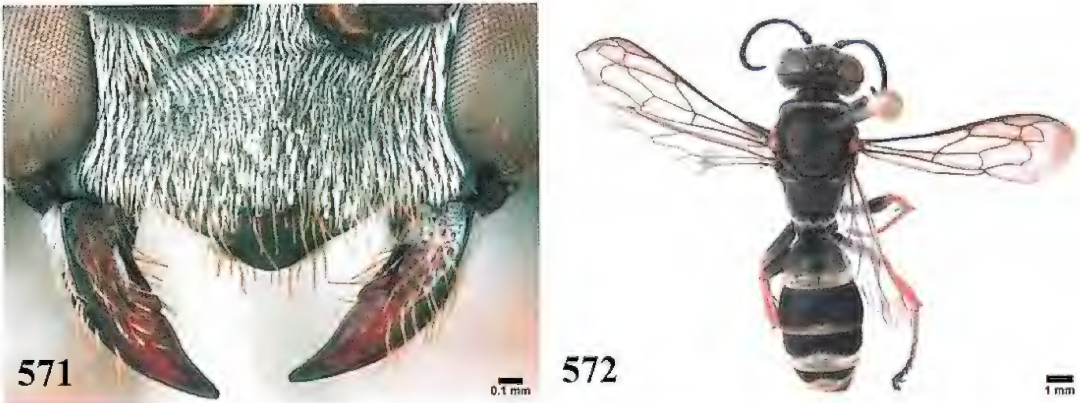
### *Pison laeviventer* Pulawski, species nova

Figures 571-573.

**NAME DERIVATION.**—*Laeviventer* is derived from two Latin words: *laevis*, meaning *smooth*, and *venter* meaning *belly*, *stomach*, a noun in apposition; with reference to the largely impunctate sterna.

**RECOGNITION.**—*Pison laeviventer* has three submarginal cells and the setae appressed on tergum I. It is characterized by the absence of the longitudinal carina separating the propodeal side from the dorsum and the posterior face, in combination with a black gaster and ferruginous tibiae and tarsi. Several species are similar, but *P. laeviventer* differs from all of them in having only a few, sparse punctures on sterna II-IV (except sternum II laterally), rather than sterna densely punctate. The posterior propodeal surface punctate throughout is a subsidiary recognition feature. These characters presumably allow recognition of the unknown male.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit roundly elongate, about as long as  $\frac{2}{3} \times$  midocellar diameter. Scutum minutely foveate or not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart; interspaces unsculptured. Tegula not enlarged, its apical margin acutely angulate. Mesopleural punctures larger than those on scutum, at center averaging about one diameter apart; interspaces slightly microsculptured. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and



FIGURES 571-572. *Pison laeiventer* Pulawski, sp. nov., female. (571) Clypeus and mandibles; (572) Body in dorsal view.

ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum, side and posterior surface punctate (punctures less than one diameter apart), posterior surface rugose ventrally. Forewing with three submarginal cells; second recurrent vein joining submarginal cell III. Posteroventral forefemoral surface with relatively large punctures, some of which are up to 2-3 diameters apart. Hindcoxal dorsum with outer margin sharply carinate in distal half. Punctures of tergum I well defined, averaging less than one diameter apart on horizontal part anterior to apical depression. Sterna II-IV aciculate, with a few, sparse punctures (except punctures dense on sternum II next to lateral margin).

Setae silvery in most specimens examined, but golden on frons, pronotum scutum, and propodeal dorsum in female from Carnarvon National Park, Queensland; on frons short, mainly appressed (but some setae on upper frons erect, about half as long as midocellar diameter), appressed on postocellar area, scutum, and tergum I; not concealing integument on clypeus; on lower gena suberect to subappressed, either sinuous or curved apically, about as long as midocellar diameter. Apical depressions of terga I-IV with silvery or golden, setal fasciae.

Head, thorax, propodeum, gaster, and femora black, mandible dark reddish apically. Tibiae and tarsi ferruginous.

♀ (Fig. 572).—Upper interocular distance equal to  $0.74-0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.1-1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.1 \times$  hindocellar diameter; eye height equal to  $1.00 \times$  distance between eye notches. Free margin of clypeal lamella rounded (Fig. 571); lamella divided laterally by transverse sulcus into upper and lower part. Dorsal length of flagellomere I  $2.8-2.9 \times$  apical width, of flagellomere IX  $1.5-1.6 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 9.6-12.7 mm; head width 2.6-3.2 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 573).—New South Wales, Queensland.



FIGURE 573. Collecting localities of *Pison laeiventer* Pulawski, sp. nov.



**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: New South Wales: Warrumbungle National Park at 31°16.9'S 149°04.8'E, 2 Jan 2012 V. Ahrens and W.J. Pulawski (AMS).

**PARATYPES:** AUSTRALIA: no other data (1 ♀, SAM). New South Wales Warrumbungle National Park at 31°16.9'S 148°59.1'E, 31 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E, 7 Jan 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS). Queensland: Carnarvon National Park at 25°03.6'S 148°14.1'E, 1 Dec 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS).

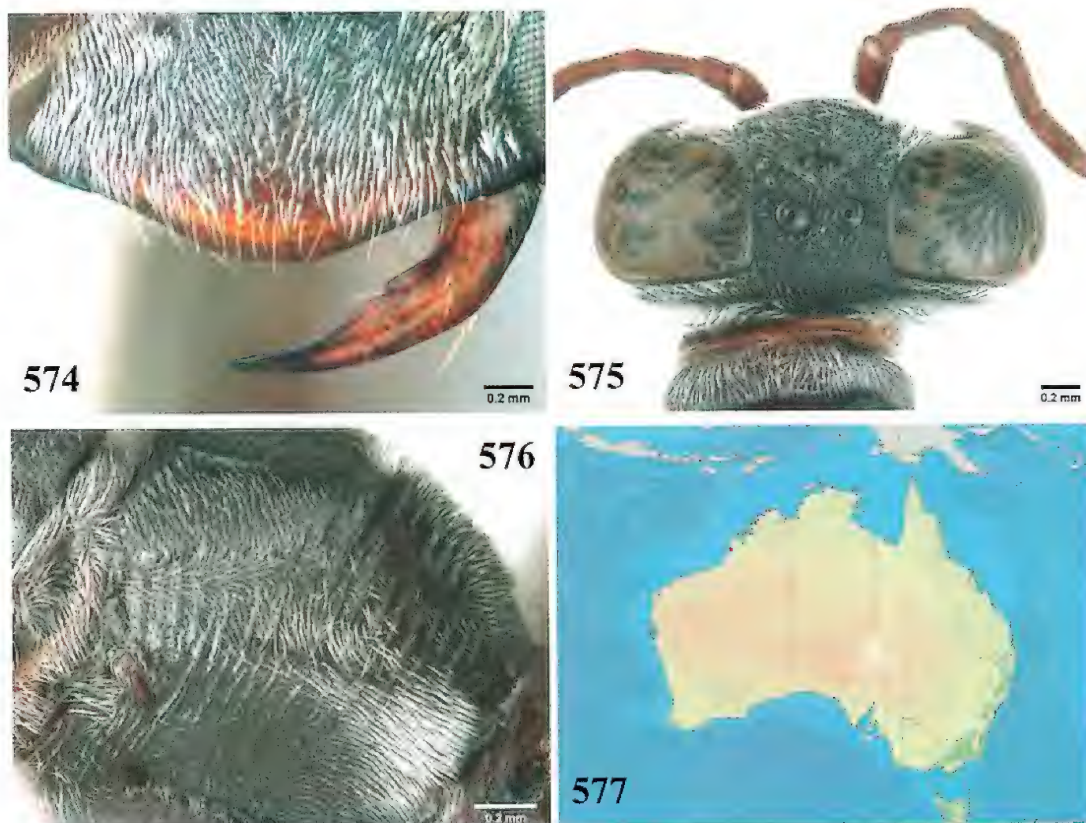
***Pison laterirugosum* Pulawski, species nova**

Figures 574–577.

**NAME DERIVATION.**—*Laterirugosum* is derived from two Latin words: *latus* (genitive: *lateris*), meaning *side*, and *rugosum*, a neuter adjective meaning *rugose*; with reference to the conspicuously rugose sides of the propodeal dorsum.

**RECOGNITION.**—*Pison laterirugosum* has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. The female (the male is unknown) is characterized by the clypeus practically not differentiated into the median lobe and lateral sections, its free margin forming almost an even arch from one orbit to the other (Fig. 574). It closely resembles *P. sinuosum*, but differs in having the mesopleural punctures less than one diameter apart (rather than about two diameters apart at the center), the propodeal dorsum with conspicuous ridges on the inner side of longitudinal propodeal carina (rather than inconspicuous), and the ocellocular distance equal to  $0.7 \times$  midocellar diameter (rather than  $1.0 \times$ ). Also similar are *Pison longulum* and *P. rotundum*, but in those species the clypeal free margin is evenly arcuate, whereas in *P. laterirugosum* the lateral portion of the free margin is minimally concave (Fig. 574), and the ridges are inconspicuous on the side of the propodeal dorsum, while conspicuous in *P. laterirugosum* (Fig. 576). Unlike *P. longulum*, the propodeal dorsum of *P. laterirugosum* is about  $1.5 \times$  as long mesally as the scutellum (rather than twice as long) and flagellomere I has ill-defined, inconspicuous punctures (rather than conspicuous). Unlike *P. rotundum*, the dorsal length of flagellomere I of *P. laterirugosum* is  $3.2 \times$  apical width (rather than  $2.1 \times$ ). The well-defined transverse ridges on the inner side of the longitudinal propodeal carina are shared with *P. hypostomale*. Unlike that species, the hypostomal carina of *P. laterirugosum* is not expanded, about as wide as the occipital carina (rather than wider than occipital carina) and the mesopleural punctures are less than one diameter apart (rather than about one diameter apart below the center).

**DESCRIPTION.**—Frons dull, finely punctate, punctures shallow, almost contiguous. Occipital carina narrowly separated from hypostomal carina. Gena narrow in dorsal view (Fig. 575). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging about one diameter apart on disk, less than one diameter apart near margins; interspaces microsculptured. Tegula not enlarged. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina present, slightly longer than midocellar diameter. Metapleural sulcus markedly costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum transversely ridged (ridges becoming conspicuous between enclosure and longitudinal carina); side ridged, punctate between ridges (Fig. 576); posterior surface conspicuously, transversely ridged. Posteroventral forefemoral surface minutely punctate, punctures about 1–2 diameters apart. Hindcoxal dorsum with outer margin sharply carinate. Horizontal part of tergum I with punctures less than one diameter apart



FIGURES 574-576. *Pison laterirugosum* Pulawski, sp. nov., female (574) Clypeus and mandible; (575) Head in dorsal view; (576) Propodeum in lateral oblique view.

FIGURE 577. Collecting locality of *Pison laterirugosum* Pulawski, sp. nov.

anteriorly, but up to about two diameters apart adjacent to apical depression mesally. Sternum II finely, densely punctate throughout.

Setae silvery, appressed on frons, scutum, and tergum I; on lower gena suberect, straight, about  $0.7-0.8 \times$  as long as midocellar diameter; not concealing integument on clypeus (integument easily visible). Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, clypeus ferruginous next to free margin, mandible ferruginous mesally, antenna ferruginous ventrally. Legs mainly black, but mid- and hindfemora and tibiae tinged with brownish, and tarsal apex brown.

♀.—Upper interocular distance equal to  $0.72 \times$  lower interocular distance; ocellocular distance equal to  $0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella forming almost an even arch from one orbit to other, minimally concave on each side (Fig. 572). Dorsal length of flagellomere I  $3.2 \times$  apical width, of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 7.7 mm; head width 2.3 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 577).—Known from one locality in coastal northern part of Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: Broome, 13 Oct 1962, E.S. Ross and D.Q. Cavagnaro (CAS).



***Pison laticeps* Pulawski, species nova**

Figures 578-581.

**NAME DERIVATION.**— *Laticeps* is a combination of the Latin adjective *latus*, broad, and the suffix *-iceps*, -headed; with reference to the unusually broad head of this species.

**RECOGNITION.**— The female of *P. laticeps* (the male is unknown) has an unusually broad head (Fig. 579); in particular the distance between the antennal sockets equals about  $3.5 \times$  socket width and  $1.8 \times$  the distance between a socket and the adjacent orbit. An undescribed species from Homevale National Park, Queensland approaches this condition, but it lacks a series of features found in *P. laticeps*: the presence of psammophores on the lower gena, posterior mandibular margin, and forefemoral venter; gena unsculptured and asetose between oral fossa and the psammophore; terga I and II and all the legs red.

**DESCRIPTION.**— Head unusually broad both at the clypeus level and on postocellar area: distance between antennal sockets about  $3.5 \times$  socket width and  $1.8 \times$  distance between antennal socket and adjacent orbit. Frons finely punctate, punctures less than one diameter apart; middle supraantennal carina absent. Gena narrow in dorsal view (Fig. 580). Labrum not emarginate. Anteromedian pronotal pit ill defined. Propleuron sparsely punctate. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; flange broadened at posterior end, about twice as high as anterior part; scutal punctures well defined, about 1-2 diameters apart on disk. Tegula enlarged, largely unsculptured. Mesopleural punctures compressed against each other. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate



578

0.1 mm



579

0.2 mm

FIGURES 578-580. *Pison laticeps* Pulawski, sp. nov., female. (578) Clypeus and mandible; (579) Head in frontal view; (580) Head in dorsal view.



580

0.2 mm

(punctures less than one diameter apart), without ridges (sculpture largely concealed by setae); side punctate (punctures less than one diameter apart), without ridges; posterior surface conspicuously ridged, punctate between ridges. Posteroventral forefemoral surface unsculptured, shiny, with a few minute, sparse punctures. Most punctures of tergum I less than one diameter apart, punctures on horizontal part anteriorly about one diameter apart. Sternum II punctate, punctures about 2-3 diameters apart mesally, apical depression impunctate mesally.

Setae silvery, oriented dorsolaterally on frons, erect on scutum (up to about two midocellar diameter long), appressed on tergum I; completely concealing integument on clypeus (lost mesally in single specimen examined). Apical depressions of terga with silvery, setal fasciae.

Head, thorax, and propodeum black, antenna ferruginous except three apical flagellomeres markedly darkened, mandible brown mesally. Femora, tibiae, and tarsi ferruginous. Terga I and II ferruginous, remaining terga black.

♀.—Upper interocular distance equal to  $0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $0.86 \times$  distance between eye notches. Free margin of clypeal lamella broadly arcuate (Fig. 578). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.8 \times$ ,  $0.5 \times$ , and  $0.5 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose on each side of oral fossa. Mandible: trimmal carina with small incision shortly beyond midlength. Length 7.7 mm; head width 2.2 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 581).—Known from one locality in northern Queensland.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Queensland: Hann River at  $15^{\circ}11'S$   $143^{\circ}52'E$ , 17 Aug – 15 Sept, P. Zborowski and S. Shattuck (ANIC).



FIGURE 581. Collecting locality of *Pison laticeps* Pulawski, sp. nov.

### *Pison leonorae* Pulawski, species nova

Figures 582-586.

**NAME DERIVATION.**—*Leonorae* is the genitive case of the Latin first declension, derived from *Leonora*, a town in Western Australia near which most specimens were collected.

**RECOGNITION.**—The male of *P. leonorae* (the female is unknown) has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein, and the setae appressed on tergum I. The apical margin of sternum VIII is either rounded, or straight, or slightly concave, but not emarginate (Fig. 583). The species has sparse, erect setae on the scutum, a feature shared with *P. subtile* and *P. penicillatum*. *Pison leonorae* differs from *P. subtile* by a number of characters given under that species (p. 438), and from *P. penicillatum* by the following: the propodeum has no longitudinal carina separating the side from the dorsum and the posterior surface (carina present in *P. penicillatum*), tergum VI and sternum VII have no erect setae posterolaterally (such setae present in *P. penicillatum*), the interocular distance at the vertex is equal to that at the clypeus or minimally greater (rather than equal to  $0.84$ – $0.88 \times$  the interocular



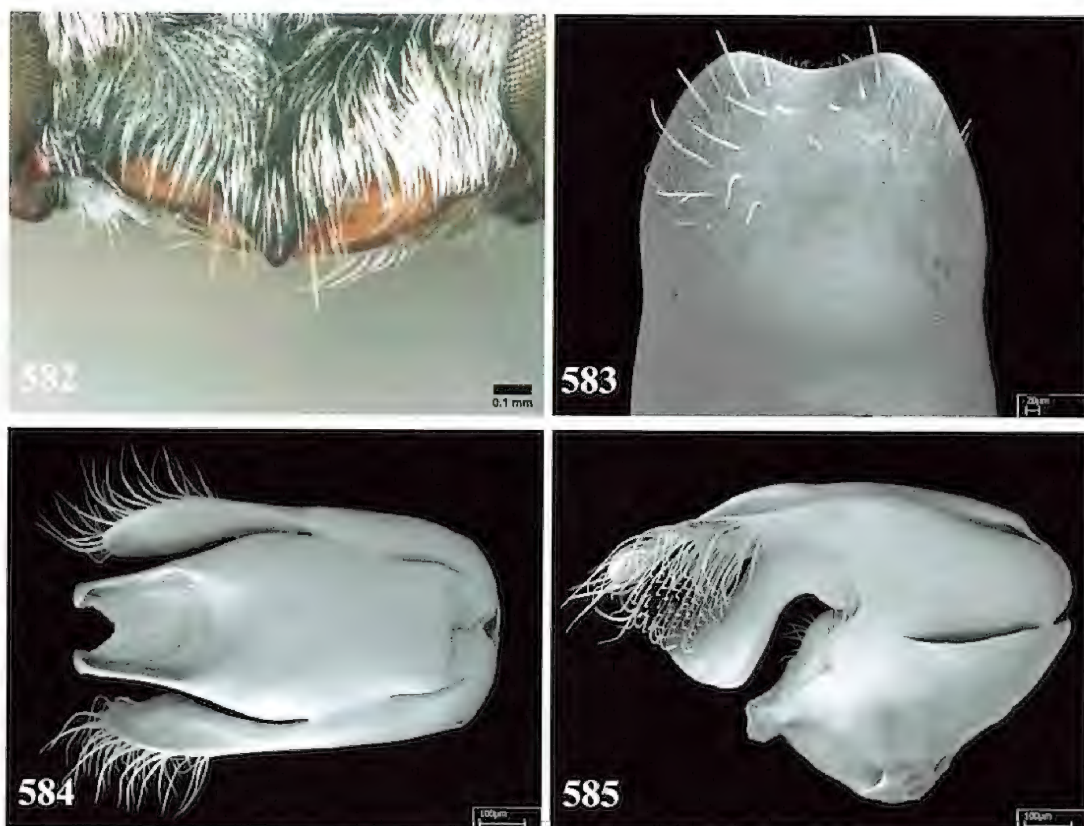


FIGURE 582. *Pison leonorae* Pulawski, sp. nov., male. (582) Clypeus; (583) Sternum VIII (ventral view); (584) Genitalia in dorsal view; (585) Genitalia in lateral view.

distance at the clypeus), and sternum II is punctate throughout (rather than largely impunctate apicomesally).

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina minimally separated from hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, somewhat shorter than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart; interspaces microsculptured. Tegula slightly enlarged. Mesopleural punctures compressed against each other. Postspiracular carina rudimentary or absent, no more than half as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, punctate between ridges; side ridged, punctate between ridges; posterior surface transversely ridged (ridges anastomosed dorsally), microscopically punctate between ridges. Posteroventral forefemoral surface finely, closely punctate. Punctures of tergum I, anterior to apical depression, about one diameter apart. Sterna II and III punctate throughout, punctures conspicuous and up to 2-3 diameters apart mesally.

Setae silvery, erect on frons, radiating from dorsal end of midfrontal carina, erect and sinuous on lower gena, sparse and erect on scutum (in addition to dense, short, erect setae), appressed on tergum I, largely to completely concealing integument on clypeus; setal length  $1.5 \times$  midocellar

diameter on lower gena,  $1.0 \times$  on scutum (two specimens with strongly worn wings lack erect scutal setae, apparently a result of age). Apical depressions of terga with silvery, setal fasciae.

Body black, mandible ferruginous mesally.

♀.— Unknown.

♂.— Upper interocular distance equal to  $1.0\text{--}1.06 \times$  lower interocular distance; ocellocular distance equal to  $1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 582). Flagellomeres III and IV minimally convex ventrally in most specimens examined, cylindrical in remaining specimens. Dorsal length of flagellomere I  $1.8\text{--}2.0 \times$  apical width, of flagellomere X  $1.0\text{--}1.1 \times$  apical width. Apical margin of sternum VIII rounded, straight, or slightly concave (Fig. 583). Genitalia: Figs. 584, 585. Length  $8.0\text{--}9.1$  mm; head width  $2.9\text{--}3.0$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 586).— Known from one locality in northern Queensland and one in southern part of Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: **Western Australia:** 28 mi. E Leonora, 18 Sept 1962, E.S. Ross and D.Q. Cavagnaro (CAS).

PARATYPES: AUSTRALIA: **Queensland:** 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$ , 18 June – 22 July 1992, P. Zborowski (1 ♂, ANIC). **Western Australia:** same data as holotype (8 ♂, CAS).



FIGURE 586. Collecting localities of *Pison leonorae* Pulawski, sp. nov.

### *Pison leptogaster* Pulawski, species nova

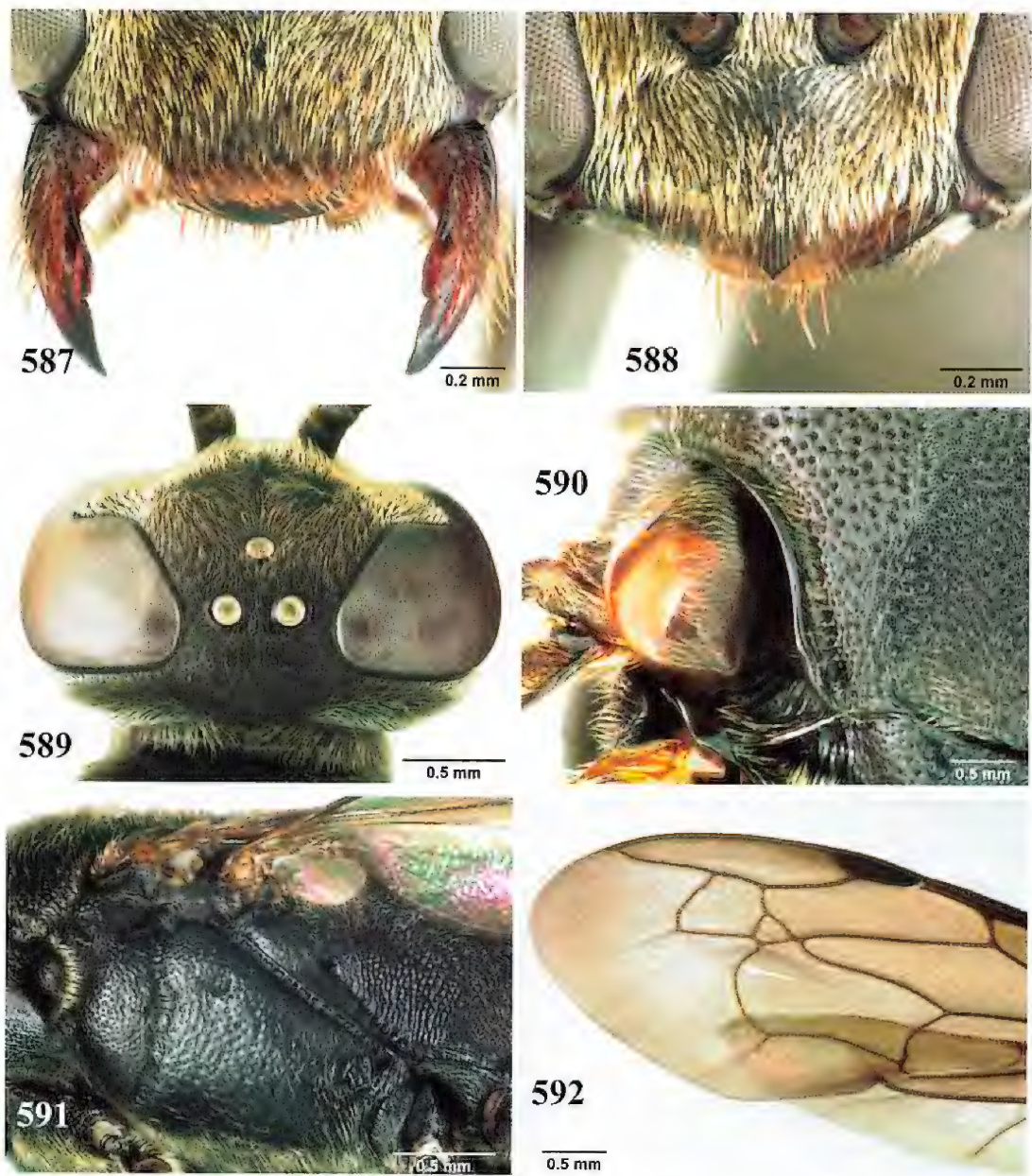
Figures 587–599.

**NAME DERIVATION.**— *Leptogaster* is derived from two Greek words: *λεπτός*, *thin*, *lean*, and *γαστήρ* (also Latin *gaster*), *belly*, *venter*; with reference to the slender gaster of this species; a noun in apposition to the generic name.

**RECOGNITION.**— The species can be recognized by the second recurrent vein received by submarginal cell II at two thirds to three quarters of the latter's length (Fig. 592), in combination with well defined scutal and mesopleural punctures (Figs. 590 and 591); some scutal punctures are up to two or three diameters apart, the mesopleural punctures increasing in size toward the venter, up to about two diameters apart ventrally. Also, the clypeal lamella of the female is almost as long laterally as mesally (Fig. 587) and tergum VI is elongate (Fig. 594). The all black antennae and legs and the golden setal fasciae of the terga (Fig. 595) are subsidiary recognition features.

**DESCRIPTION.**— Frons moderately swollen, dull, finely punctate, punctures about one diameter apart at center, middle supraantennal carina inconspicuous or absent. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 589). Labrum not emarginate. Thorax and gaster slightly elongate (Fig. 595). Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, most of them less than one diameter apart, but some punctures up to two or three diameters apart; interspaces finely microsculptured. Tegula slightly enlarged (Fig. 590). Mesopleural punctures well defined, increasing in size toward venter, about one diameter apart at center, but up to about two diameters apart ventrally (Fig. 589).





FIGURES 587-592. *Pison leptogaster* Pulawski, sp. nov. (587) Female clypeus and mandibles; (588) Male clypeus; (589) Female head in dorsal view; (590) Female tegula and adjacent scutum; (591) Female mesopleuron; (592) Distal portion of female forewing (arrow shows second recurrent vein).

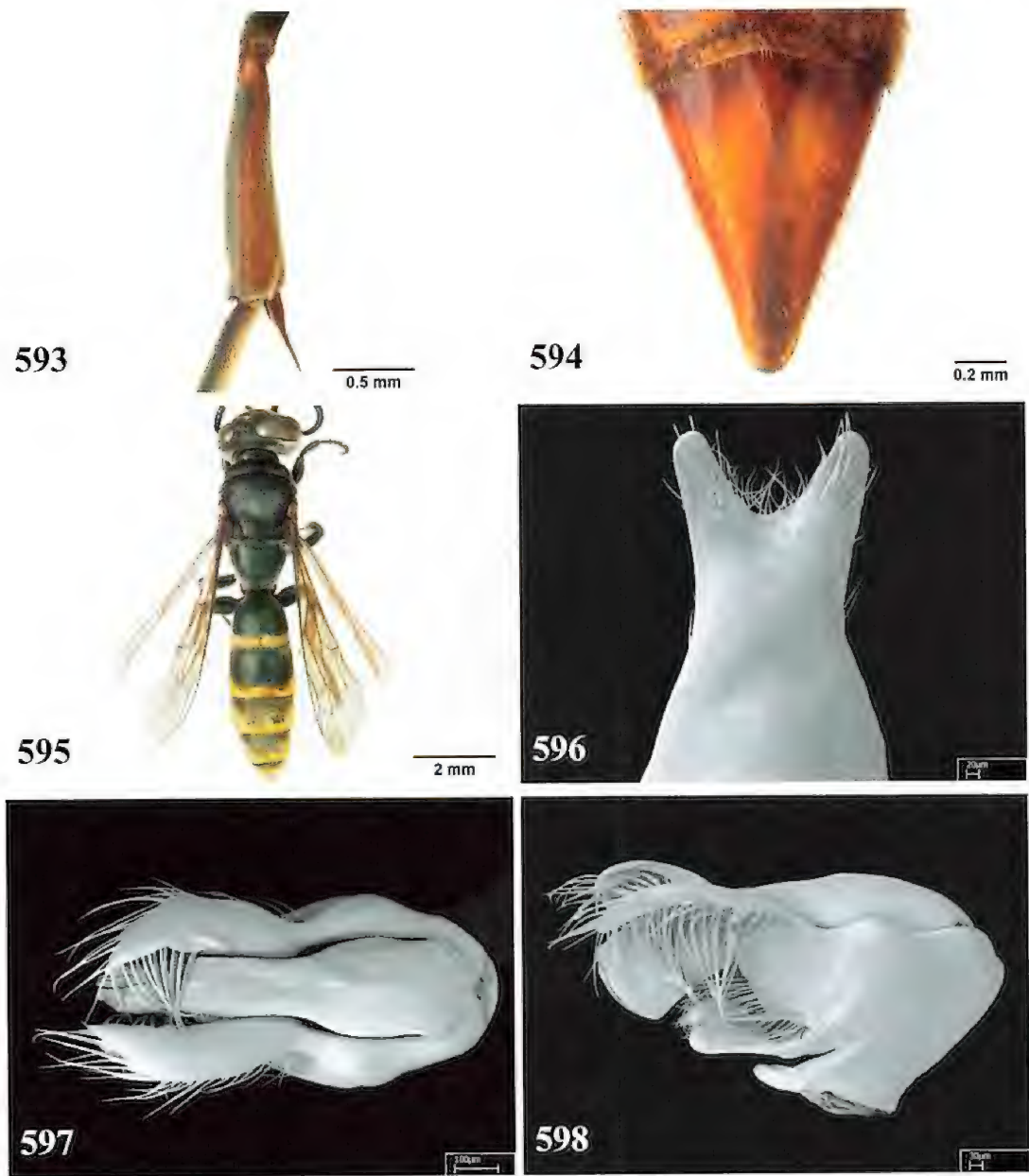


FIGURE 593-598. *Pison leptogaster* Pulawski, sp. nov. (593) Left hindtibia of female in dorsal view; (594) Female tergum VI in dorsal view; (595) Female body in dorsal view; male: (596) Sternum VIII (ventral view); (597) Genitalia in dorsal view; (598) Genitalia in lateral view.



Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely (almost transversely) ridged, punctate between ridges, with fine transverse ridges emerging from middle carina, but without median sulcus; side finely ridged, punctate between ridges; posterior surface conspicuously, transversely ridged. Forewing with three submarginal cells; second recurrent vein received by submarginal cell II at two thirds to three quarters of cell's length (Fig. 590). Posteroventral forefemoral surface with minuscule punctures that average several diameters apart. Outer surface of hindtibia with spines replaced by fine setae (Fig. 593). Punctures of tergum I well defined, averaging about two diameters apart on horizontal part. Punctures of sternum II well defined and averaging several diameters apart mesally, fine on apical depression.

Setae golden or silvery on clypeus; appressed on frons, scutum, forecoxal venter, femoral venters, and tergum I; inconspicuous and oriented obliquely dorsally on upper frons, but obliquely ventrad beneath midocellus; setae of lower gena erect, straight or curved apically, about as long as midocellar diameter; not concealing integument on clypeus in female, partly concealing in male; gastral setae golden, forming well-defined fasciae on apical depressions of terga (Fig. 595).

Body including antennae and legs black, mandible brown apically, also clypeal lamella of female brown; apical depressions of gastral terga yellowish, apical segment yellowish (darkened in some females).

♀ (Fig. 595).— Upper interocular distance equal to  $0.70\text{--}0.72 \times$  lower interocular distance; ocellocular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}0.9 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella slightly rounded, almost as long laterally as mesally (Fig. 587). Dorsal length of flagellomere I  $2.4\text{--}2.5 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Tergum VI elongate (Fig. 594). Length 9.5–10.8 mm; head width 2.1–2.3 mm.

♂.— Upper interocular distance equal to  $0.78\text{--}0.80 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 588). Dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Sternum VIII conspicuously emarginate (Fig. 596). Genitalia: Figs. 597, 598. Length 7.2–8.5 mm; head width 2.0–2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 599).— Known from a few adjacent localities in northern Queensland and from the island of New Guinea.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: Queensland:** 12 km SSE Heathlands at  $11^{\circ}51'S$   $142^{\circ}38'E$ , 21 Aug – 17 Sept 1992, P. Zborowski and L. Miller (ANIC).

**PARATYPES:** **AUSTRALIA: Queensland:** 14 km ENE Heathlands at  $11^{\circ}41'S$   $142^{\circ}42'E$ , 12 Nov – 14 Dec 1993, P. Zborowski (1 ♀, ANIC); 15 km ENE Heathlands at  $11^{\circ}41'S$   $142^{\circ}42'E$ , 15–26 Jan 1992, I.D. Naumann and T. Weir (3 ♀, ANIC; 1 ♀, CAS); 12 km SSE Heathlands at  $11^{\circ}51'S$   $142^{\circ}38'E$ , 25 Apr – 7 June 1992, T. McLeod (1 ♀, ANIC), 25 July – 21 Aug 1992, P. Zborowski and J.C.



FIGURE 599. Collecting localities of *Pison leptogaster* Pulawski, sp. nov.

Cardale (2 ♀, 1 ♂, ANIC; 1 ♂, CAS), 21 Aug – 17 Sept 1992, P. Zborowski and L. Miller (4 ♀, 1 ♂, ANIC; 3 ♀, CAS), 17 Sept – 22 Oct 1992, P. Zborowski (1 ♀, ANIC), 22 Oct – 22 Nov 1992, P. Zborowski and A. Calder (5 ♀, ANIC; 1 ♀, CAS); Iron Range, 27 Apr – 4 May 1973, S.R. Monteith (1 ♀, ANIC); 11 km ENE Mount Tozer at 12°43'S 143°18'E, 11-16 July 1986, J.C. Cardale (1 ♂, ANIC).

INDONESIA: Western Papua (= Indonesian New Guinea): Merauke at 8°30'S 140°22'E, 3 Apr 1988, R. Hensen (1 ♀, RMNH).

*Pison longulum* Pulawski, species nova

Figures 600-609.

NAME DERIVATION.— *Longulum*, Latin neuter adjective, a diminutive of *longus*, for *long*, *far*; in reference to its relatively small size and an elongate propodeum.

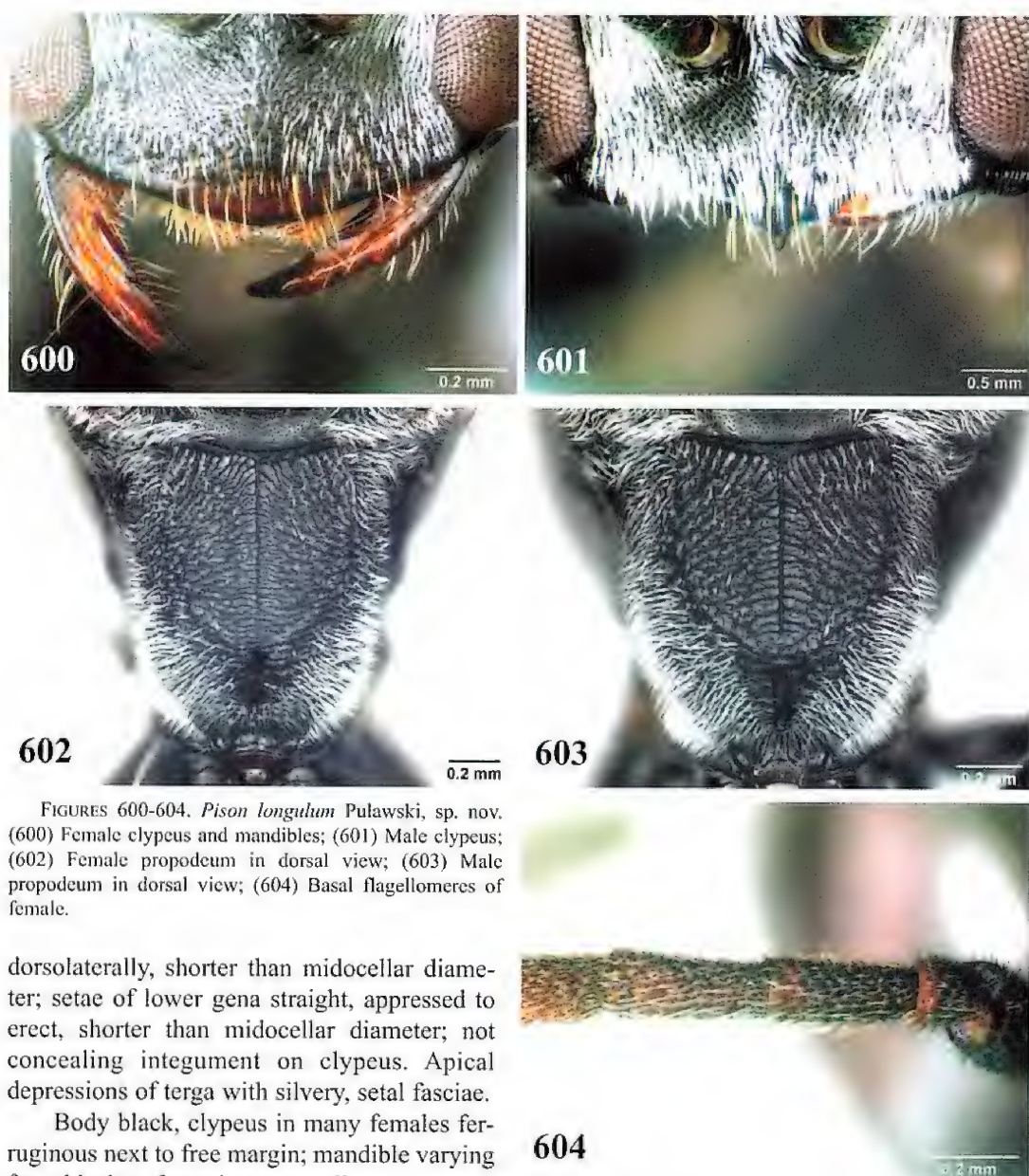
RECOGNITION.— *Pison longulum* is an all black species with three submarginal cells, the second recurrent vein contiguous with second intersubmarginal vein or nearly so, and setae appressed on tergum I. It is characterized by an elongate propodeum (Figs. 602, 603), whose dorsum is  $2.0 \times$  as long mesally as the scutellum in the females, and about  $1.75 \times$  in males. The female shares with *P. rotundum* an unusual shape of the clypeus whose free margin is evenly arcuate from one orbit to the other, without forming a median lobe and lateral concavities (Fig. 600). Also, flagellomere I has conspicuous punctures (Fig. 604) and its dorsal length is about  $3.0 \times$  apical width, and the scutellum is flat. In the females of *P. rotundum* and *P. laterirugosum* (the males are unknown), the propodeal dorsum is  $1.5 \times$  as long as the scutellum, flagellomere I has minute, inconspicuous punctures, and the scutellum is slightly convex. In *P. laterirugosum*, in addition, the free margin of the clypeus is minimally concave on each side and the propodeal dorsum has conspicuous ridges near the lateral margin (ridges inconspicuous in *P. longulum*).

The male, in addition to the above characters, has the flagellum cylindrical, sterna evenly punctate, apical margin of sternum VIII shallowly, broadly emarginate, with the apical corner acutely angulate (Fig. 605). It has a distinctive clypeus: the free margin of the clypeal lamella is markedly concave on each side of the midpoint, and the expanded area adjacent to the orbit is somewhat prominent, shiny, impunctate (Fig. 601).

DESCRIPTION.— Frons swollen mesally above antennal socket, dull, finely punctate, punctures shallow, less than one diameter apart. Labrum narrowly, shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart; interspaces microsculptured. Tegula slightly enlarged. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina present, slightly shorter than midocellar diameter. Mesopleuron adjacent to metapleuron and propodeal side adjacent to metapleuron below dorsal pit with conspicuously foveolate sulcus. Propodeum elongate (Figs. 602, 603), its dorsum  $2.0 \times$  as long mesally as scutellum in females, about  $1.75 \times$  in males; in larger specimens with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, without such carina in smaller ones; dorsum irregularly obliquely ridged, irregularly rugose in apical half; side ridged, punctate between ridges; posterior surface coarsely, transversely ridged, with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Posteroventral forefemoral surface finely punctate, punctures up to about two diameters apart in female, about one diameter apart in male. Hindcoxa dorsum with outer margin not carinate. Punctures of tergum I averaging more than one diameter apart on horizontal portion. Sterna punctate throughout, punctures well defined.

Setae silvery, appressed on scutum and tergum I; most setae of upper frons suberect, oriented





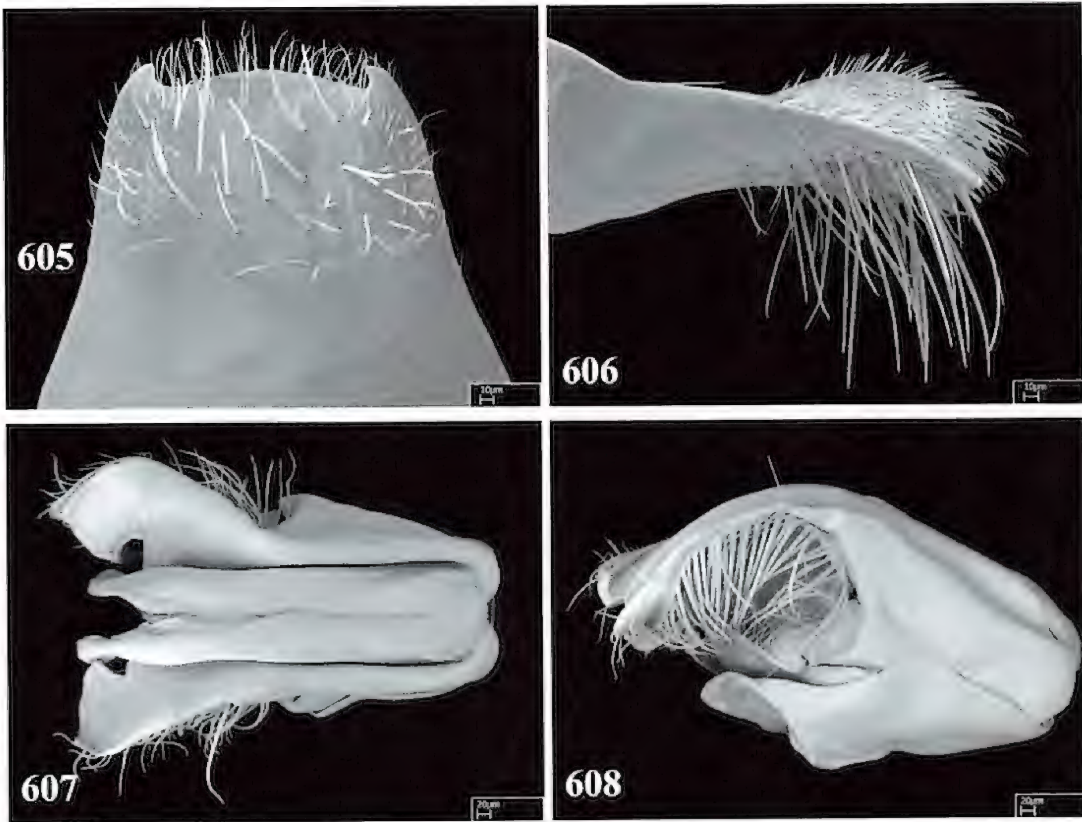
FIGURES 600-604. *Pison longulum* Pulawski, sp. nov.  
(600) Female clypeus and mandibles; (601) Male clypeus;  
(602) Female propodeum in dorsal view; (603) Male  
propodeum in dorsal view; (604) Basal flagellomeres of  
female.

dorsolaterally, shorter than midocellar diameter; setae of lower gena straight, appressed to erect, shorter than midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body black, clypeus in many females ferruginous next to free margin; mandible varying from black to ferruginous mesally.

♀.— Upper interocular distance equal to  $0.70-0.74 \times$  lower interocular distance; ocellocular distance equal to  $0.7-1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.0 \times$  hindocellar diameter; eye height equal to  $1.02-1.12 \times$  distance between eye notches. Free margin of clypeal lamella evenly arcuate orbit to orbit (Fig. 600), without median lobe. Scape and flagellomere I conspicuously punctate (Fig. 604); dorsal length of flagellomere I  $2.5-2.6 \times$  apical width, of flagellomere IX  $1.3-1.4 \times$  apical width. Mandible: trimmal carina with minute incision shortly beyond midlength. Length 6.2-8.4 mm; head width 1.6-2.3 mm.

♂.— Upper interocular distance equal to  $0.84-0.90 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.2 \times$



FIGURES 605-608. *Pison longulum* Pulawski, sp. nov., male. (605) Sternum VIII (ventral view); (606) Sternum VIII in lateral view; (607) Genitalia in dorsal view; (608) Genitalia in lateral view.

hindocellar diameter; eye height equal to  $1.12-1.16 \times$  distance between eye notches. Clypeus with sharply pointed lobe, free margin concave on each side of midpoint; expanded area adjacent to orbit somewhat prominent, shiny, impunctate (Fig. 601). Dorsal length of flagellomere I  $1.7-2.0 \times$  apical width, of flagellomere X  $1.3-1.6 \times$  apical width. Sternum VIII broadly, shallowly emarginate apically, straight along most of hindmargin, with acutely angulate apicolateral corner (Fig. 605), in lateral view: Fig. 606. Genitalia: Figs. 607, 608. Length 4.4-6.2 mm; head width 1.3-1.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 609).—Northern parts of Northern Territory, of Queensland, and of Western Australia.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA: Northern Territory:** Gregory National Park at  $16^{\circ}03'01''\text{S}$   $130^{\circ}24'07''\text{E}$ , 9-20 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

**PARATYPES:** **AUSTRALIA** (M.E. Irwin and F.D. Parker collectors or as indicated): **Northern Territory:** Gregory National Park at  $16^{\circ}03'01''\text{S}$   $130^{\circ}24'07''\text{E}$ , 9-20 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, USU); Keep River National Park, M.E. Irwin, F.D. Parker, and C. Lambkin, at  $15^{\circ}55'22''\text{S}$   $129^{\circ}03'22''\text{E}$ , 3-6 June 2001 (1 ♀, ANIC), at  $15^{\circ}57'06''\text{S}$   $129^{\circ}01'50''\text{E}$ , 6-8 June 2001 (1 ♀, ANIC), and at  $15^{\circ}57'55''\text{S}$   $129^{\circ}01'52''\text{E}$ , 10-13 June 2001 (2 ♀, ANIC). **Queensland:** Musselbrook Camp at  $18^{\circ}36'\text{S}$   $138^{\circ}08'\text{E}$ , 8-21 May 1995, I.D. Naumann (1 ♀, ANIC). **Western Australia:** Great Northern Highway at  $23^{\circ}02.6'\text{S}$   $118^{\circ}50.2'\text{E}$ , 6-17 May 2003 (1 ♂, ANIC; 2 ♀, CAS); Karijini National Park at  $22^{\circ}28.4'\text{S}$   $118^{\circ}32.6'\text{E}$ , 23 Apr – 4 May 2003 (3 ♀, 2 ♂, ANIC), 5-16 May (1 ♀, ANIC); Kennedy Range National Park at  $24^{\circ}38.7'\text{S}$   $115^{\circ}10.7'\text{E}$ , 26 Apr – 10 May 2003 (3 ♀, CAS); 95 km E Marble Bar at  $21^{\circ}16.8'\text{S}$   $120^{\circ}36.3'\text{E}$ , 2-15 May 2003 (2 ♀, ANIC); 104 km E Marble Bar at  $21^{\circ}19.1'\text{S}$   $120^{\circ}40.3'\text{E}$ , 2-15 May 2003 (1 ♀, ANIC); Mount Robinson



near Great Northern Highway at 22°03'S 118°55'E, 23 Apr – 6 May 2003 (1 ♀, USU); 65 km E Nanutarra Roadhouse at 22°27.8'S 116°02.6'E, 5–12 May 2003 (1 ♀, USU); Nanutarra – Wittenoom road at 22°26'36"S 117°48'23"E, 15–19 May 2006, CVA [= Conservation Volunteers Australia] (1 ♀, AMS); 47 km S Pardoo Roadhouse on Shay Gap Road at 20°22.7'S 120°01.3'E, 1–14 May 2003 (4 ♀, 1 ♂, CAS; 8 ♀, 2 ♂, USU); 8 km E Pebble Mouse Creek on Great Northern Highway at 23°06.3'S 118°59.4'E, 23 Apr – 6 May 2003 (1 ♂, CAS); 60 km N Tom Price at 22°18.8'S 117°40.5'E, 20 Apr 2003 (1 ♂, CAS).



FIGURE 609. Collecting localities of *Pison longulum* Pulawski, sp. nov.

***Pison lucens* Pulawski, species nova**

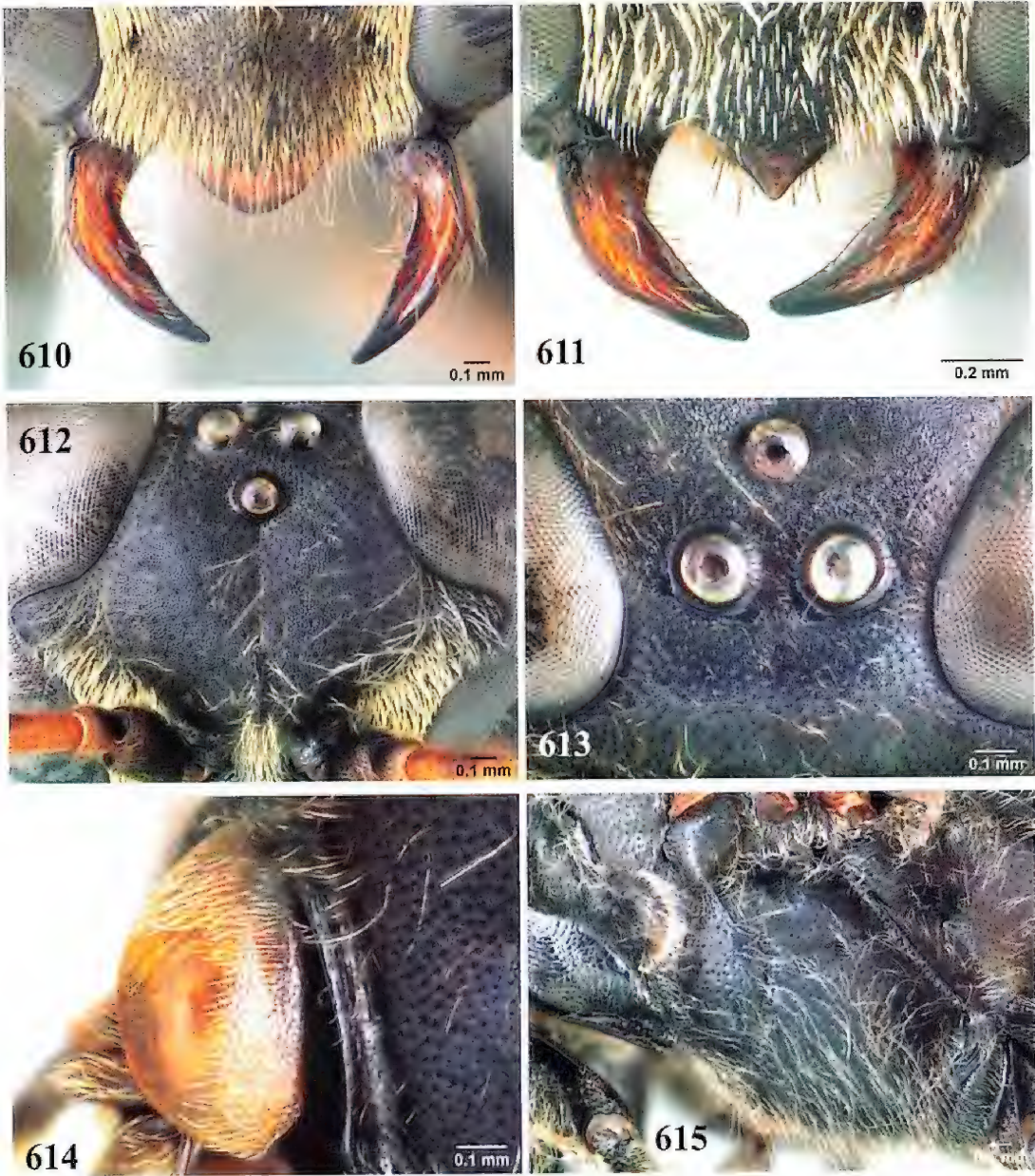
Figures 610–621.

**NAME DERIVATION.**—*Lucens*, present participle of the verb *lucere*, meaning *shiny* or *brilliant*; with reference to the shiny integument of this species.

**RECOGNITION.**—*Pison lucens* and *priscum* share the following unique combination: the body with abundant, conspicuous erect setae on the head, thorax, propodeum and tergum I; the propodeum sparsely punctate (punctures averaging several diameters apart), with shiny, unsculptured interspaces and no longitudinal carina between the propodeal dorsum and the side and the posterior surface. Unlike *P. priscum* (which is all black, with silvery setae), the flagellum largely and the tibiae and tarsi are ferruginous in *P. lucens*, and the setae are golden on the clypeus and terga.

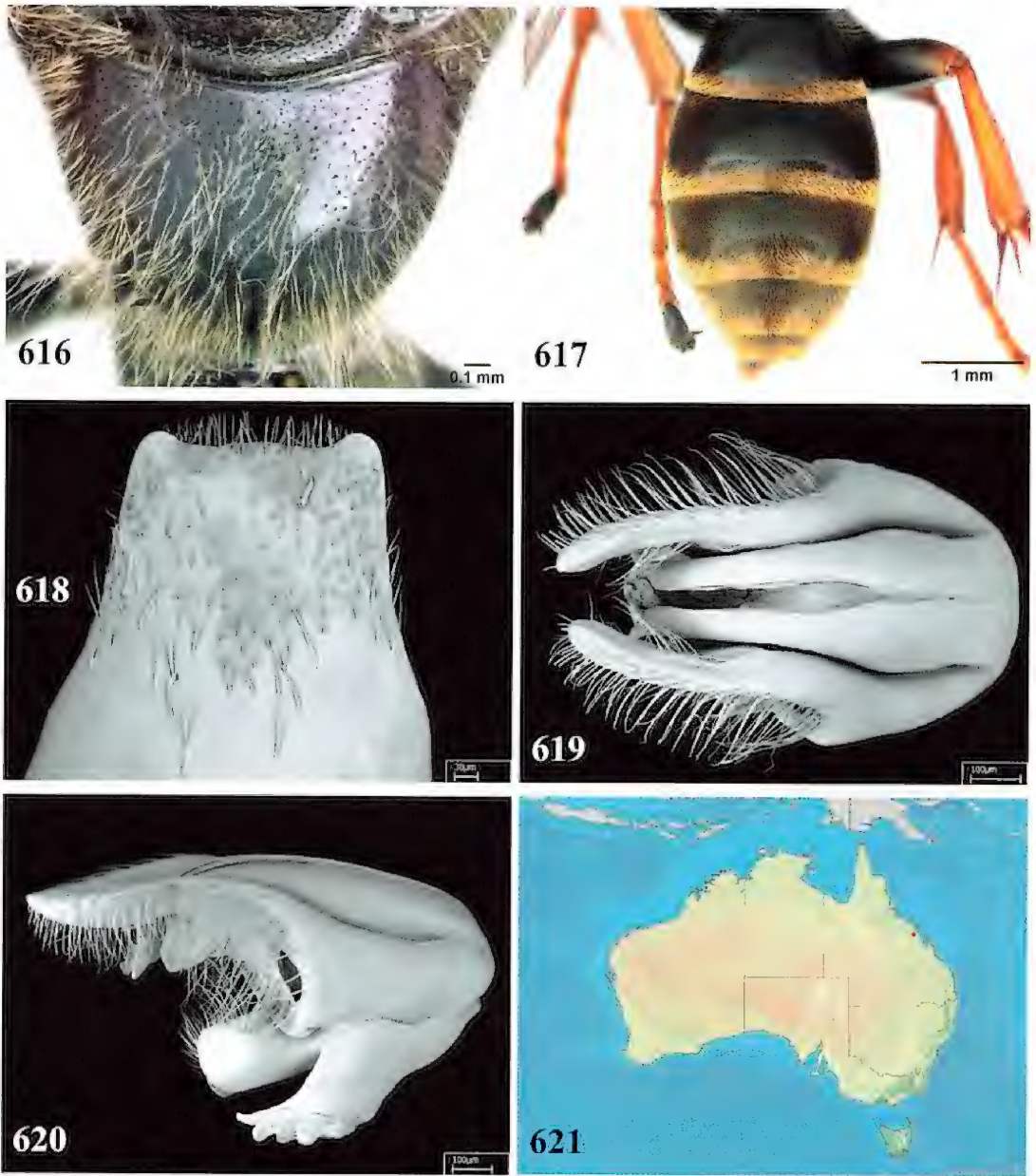
**DESCRIPTION.**—Frons dull, microsculptured, with shallow punctures that are several diameters apart (Fig. 612). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined (Fig. 614), averaging 1–2 diameters apart (about 2 widths at center); interspaces finely microsculptured, but shiny. Tegula somewhat enlarged. Mesopleural punctures well defined, averaging several diameters apart at center (Fig. 615); interspaces with evanescent microsculpture. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Entire propodeum punctate (Fig. 616), without ridges (punctures averaging several diameters apart, interspaces unsculptured), with or without median carina on dorsum in shallow, median depression, without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle. Posteroventral forefemoral surface with punctures of varying size, averaging several diameters apart. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I many diameters apart on basal slope, several diameters apart on horizontal part, about one diameter apart next to apical depression. Sterna punctate throughout, on sternum II more than one diameter apart (except laterally).

Setae pale, erect on frons, thorax, propodeum, femoral venters, and tergum I (no appressed setae on upper frons); golden and not concealing integument on clypeus; setal length on lower gena about equal to maximum forefemoral width, on upper frons slightly less than maximum forefemoral width; longest setae of hindfemoral venter about equal to midocellar diameter, of tergum I about  $1.5 \times$  midocellar diameter. Tergal setae golden, forming well defined fasciae on apical depressions (Fig. 617).



FIGURES 610-615. *Pison lucens* Pulawski, sp. nov. (610) Female clypeus and mandibles; (611) Male clypeus and mandibles; (612) Upper frons of female; (613) Female vertex; (614) Female tegula and adjacent scutum; (615) Female mesopleuron.





FIGURES 616-620. *Pison lucens* Pulawski, sp. nov. (616) Propodeal dorsum of female; (617) Female gaster in dorsal view; male: (618) Sternum VIII (ventral view); (619) Genitalia in dorsal view; (620) Genitalia in lateral view.  
FIGURE 621. Collecting locality of *Pison lucens* Pulawski, sp. nov.

Head, thorax, propodeum, femora (except apically), and gaster black (apical depressions of terga brown), in female clypeal lamella ferruginous; mandible black basally and apically, ferruginous mesally; scape black, pedicel partly ferruginous, flagellum ferruginous except three or four apical flagellomeres all black. Femora at very apex, tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.70\text{--}0.72 \times$  lower interocular distance; ocellular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}0.9 \times$  hindocellar diameter (Fig. 613); eye height equal to  $0.96\text{--}0.98 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 610). Dorsal length of flagellomere I  $2.6\text{--}2.7 \times$  apical width, of flagellomere IX  $1.4\text{--}1.6 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length  $10.2\text{--}10.8$  mm; head width  $2.9\text{--}3.0$  mm.

♂.—Upper interocular distance equal to  $0.90\text{--}0.96 \times$  lower interocular distance; ocellular distance equal to  $1.0\text{--}1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}1.0 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 611). Dorsal length of flagellomere I  $2.1\text{--}2.2 \times$  apical width, of flagellomere X  $1.1\text{--}1.2 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 618). Genitalia: Figs. 619, 620. Length  $6.4\text{--}7.8$  mm; head width  $2.1\text{--}2.2$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 622).—Known from one locality in eastern Queensland.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Queensland: Eungella National Park, 16–19 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (QMB, registration number T228761).

PARATYPES: AUSTRALIA: Queensland: Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$ , 31 Oct 2006, V. Ahrens and W.J. Pulawski (4 ♀, CAS); same locality and collectors: 2 Nov 2006 (2 ♀, CAS), 5 Nov 2012 (1 ♀, CAS), 6 Nov 2012 (6 ♀, CAS), 7 Nov 2012 (3 ♀, 2 ♂, CAS), 8 Nov 2012 (1 ♀, CAS), 10 Nov 2012 (1 ♀, 1 ♂, CAS), 11 Nov 2012 (3 ♀, CAS), 16–19 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (3 ♀, QMB).

### *Pison lutescens* Turner

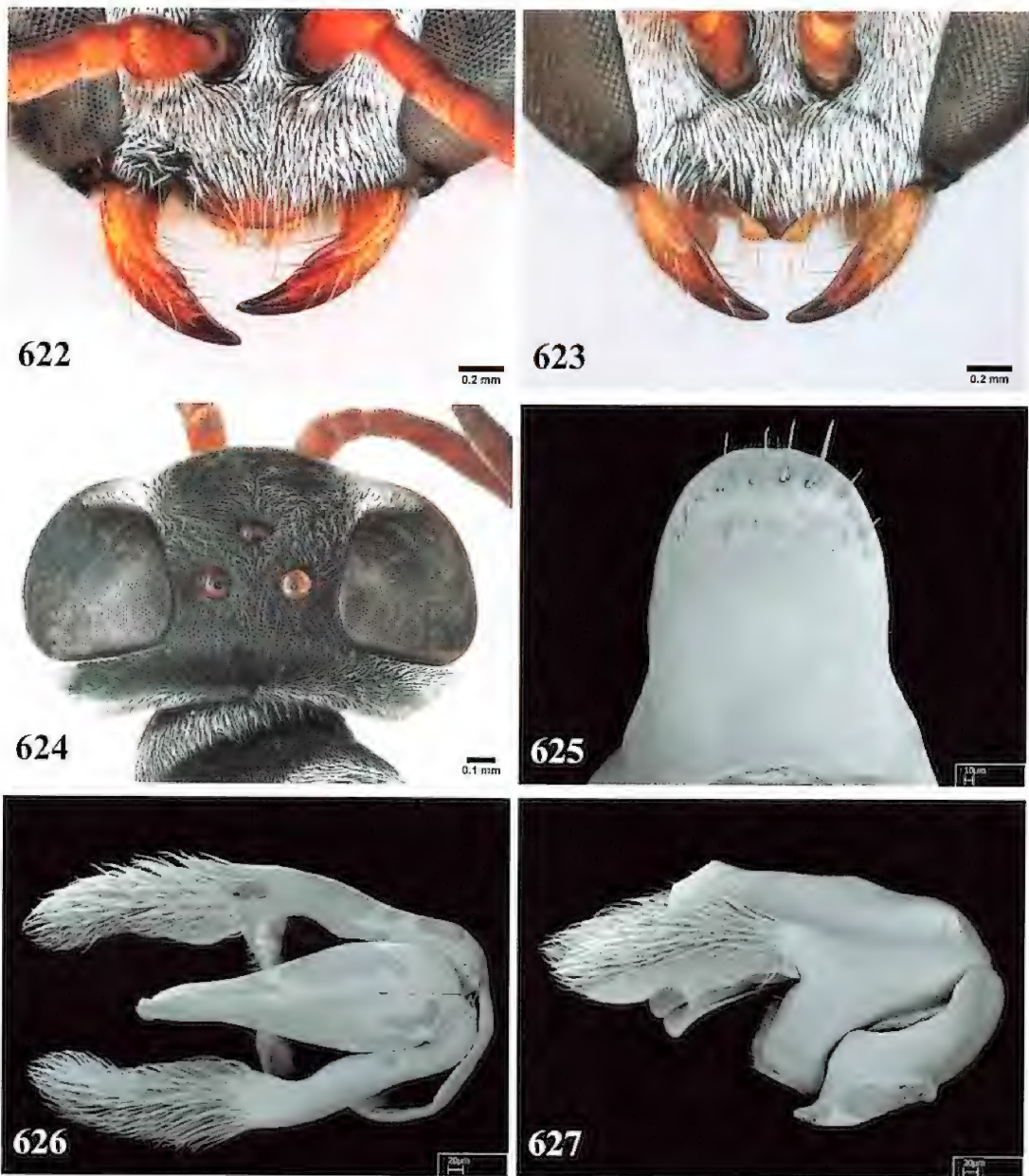
Figures 622–628.

*Pison lutescens* Turner, 1916b:604, ♀. Lectotype: ♀, Western Australia: Mundaring Weir (BMNH), present designation, examined. —Turner, 1916b:597 (in key to Australian *Pison*); Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:260 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—In his original description of *lutescens*, Turner did not mention the number of specimens examined. I have designated as the lectotype the only specimen present in The Natural History Museum, London.

**RECOGNITION.**—*Pison lutescens* is a small species (length  $3.8\text{--}4.4$  mm), characterized by the following: femora, tibia, and female gaster ferruginous, in male at least segments I–III ferruginous (contrasting with the black thorax and propodeum); wing venation unspecialized (three submarginal cells present, second recurrent vein interstitial with second intersubmarginal vein); all body setae appressed, silvery on head; tegula largely impunctate; mesopleural punctures less than one diameter apart; propodeal dorsum ridged; and in the female the clypeal free margin is only shallowly concave between the lobe and the orbit. Unlike *P. punctatum*, sternum II is punctate throughout in *P. lutescens* (rather than impunctate apicomeresally) and unlike *P. decipiens* the tegula is not elongate and in most specimens the middle supraantennal carina is practically absent (replaced by fine midline in some individuals); in the female, the free margin of the clypeal lamella is only slightly convex on each side of the midpoint and the propodeal side is shallowly concave, and male sternum VIII is rounded apically (in *P. decipiens*, the middle supraantennal carina is well defined, the tegula is elongate, in the female the free margin of the clypeal lamella is distinctly convex on each side of the midpoint and the propodeal side is flat, and male sternum VIII is emar-





FIGURES 622-627. *Pison lutescens* Turner. (622) Female clypeus; (623) Male clypeus; (624) Female head in dorsal view; male; (625) Sternum VIII (ventral surface); (626) Genitalia in dorsal view; (627) Genitalia in lateral view.

ginate apically). The short flagellomere I (dorsal length  $1.4 \times$  apical width in female,  $1.2-1.3 \times$  in male) is a subsidiary recognition feature.

**DESCRIPTION.**—Head almost globose in dorsal view (Fig. 624). Frons swollen above antennal socket, dull, shallowly, minutely punctate, punctures less than one diameter apart; middle supraantennal carina in most specimens barely recognizable (replaced by fine midline in some individuals). Distance between antennal sockets markedly less than distance between socket and adjacent orbit. Occipital carina narrowly separated from hypostomal carina. Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, mostly about one diameter apart. Mesopleuron dull, punctures compressed against each other, largely concealed by vestiture. Postspiracular carina rudimentary, markedly shorter than midocellar diameter. Metapleural sulcus minutely costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged; side finely ridged, punctate between ridges in posterior half or more, slightly concave in female; posterior surface ridged. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I fine but well defined. Sterna closely punctate throughout in female, in male sternum II closely punctate throughout, sterna IV-VI with punctures more than one diameter apart.

Setae silvery, appressed on entire body; terga with setal fasciae on apical depressions.

Head, thorax, and propodeum black, female clypeus ferruginous next to lobe free margin; mandible black basally, yellowish brown subbasally, ferruginous subapically, dark apically; antenna ferruginous (scape, pedicel, and apical flagellomeres dark dorsally in most specimens, apical flagellomere all dark in some specimens). Femora, tibiae, and tarsi ferruginous, gaster all ferruginous in female, at least segments I-III ferruginous in male (remainder dark brown).

♀.—Upper interocular distance equal to  $0.92 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli  $1.9-2.0 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Middle clypeal lobe only slightly prominent, free margin straight on each side of lamella (Fig. 622). Dorsal length of flagellomere I  $1.4 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina with incision at about two thirds of length. Length 4.3-4.4 mm; head width 1.3 mm.

♂.—Upper interocular distance equal to  $0.88-0.89 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.1 \times$  hindocellar diameter, distance between hindocelli  $2.0-2.1 \times$  hindocellar diameter; eye height equal to  $1.00-1.04 \times$  distance between eye notches. Free margin of clypeal lamella slightly concave on each side of midpoint (Fig. 623). Dorsal length of flagellomere I  $1.2-1.3 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII impunctate and asetose except subapically, not emarginate apically (Fig. 625). Genitalia: Figs. 626, 627. Length 3.8 mm; head width 1.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 628).—Northern Territory, New South Wales, Queensland, South Australia, Western Australia.

**RECORDS.**—AUSTRALIA: **New South Wales:** Fowlers Gap Research Station at  $31^{\circ}05'S$   $141^{\circ}42'E$  (2 ♀, 2 ♂, AMNH; 1 ♂, ANIC), Kinchega National Park at  $32^{\circ}22.8'S$   $142^{\circ}23.6'E$  (1 ♂, CAS). **Northern**



FIGURE 628. Collecting localities of *Pison lutescens* Turner.



**Territory:** West MacDonnell National Park ca 3 km W road to Simpson Gap at 23°41.8'S 133°41.7'E (1 ♀, 1 ♂, CAS; 1 ♀, NTM). **Queensland:** Crediton State Forest at 21°11.9'S 148°29.9'E (1 ♂, CAS), Eungella National Park (1 ♀, QMB). **South Australia:** Brachina Gorge in Flinders Range National Park at 31°20'S 138°34'E (1 ♀, CAS) and 31°20'S 138°37'E (1 ♀, 6 ♂, ANIC; 2 ♂, CAS), Chowilla Game Reserve 24 air km N Renmark at 33°58.0'S 140°48.8'E (6 ♂, CAS), 10 km NNW Penong at 31°50.3'S 132°57.9'E (1 ♀, CAS), Quinyambie Station 23.2 km NE Coonanna Bore at 29°42'07"S 140°56'07"E (1 ♂, SAM), 12 km ESE Taylorville at 34°08'S 140°06'E (1 ♂, ANIC). **Western Australia:** Crossing Pool in Chichester Range (2 ♂, USNM), Merredin (3 ♂, QMB), 24 km S Mingenew (1 ♂, QMB), Mundaring Weir (1 ♀, BMNH, lectotype of *Pison lutescens*).

### *Pison marginatum* F. Smith

Figures 629-639.

*Pison marginatum* F. Smith, 1856:314, ♀ (as *marginatus*, incorrect original termination). Lectotype: ♀, Australia: New South Wales: Hunter River (BMNH), **present designation**, examined. – F. Smith, 1869:290 (in checklist of *Pison*, as *marginatus*); Kohl, 1885:187 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*), 609 (recognition characters; Australia: Melbourne, Mackay, as *marginatus*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Evans, Matthews, and Hook, 1981:225 (nesting habits); Cardale, 1985:260 (in catalog of Australian Sphecidae); Naumann, 1990a:25 (Norfolk and Philip Islands); Smithers, 1998:46 (in list of insects of Norfolk Island).

*Pison pallidipalpe* F. Smith, 1863a:35, ♀ (as *pallidipalpis*, incorrect original termination). Lectotype: ♀, Indonesia: island of Seram: no specific locality (BMNH), **present designation**, examined. **New synonym.** – F. Smith, 1863b:135 (known from Seram), 1865:85 (Indonesia: Moluku: Island of Morotai), 1869:291 (in checklist of *Pison*), 1871:366 (in catalog of Oriental Aculeata); Kohl, 1885:187 (in checklist of world *Pison*); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Cameron, 1913:82 (Indonesia: Western Papua: Moluccas: Island of Saonek); W. Schulz, 1905:214 (Papua New Guinea: Finschhafen, redescription); R. Turner, 1916b:625 (diagnostic characters); Bohart and Menke, 1976:336 (in checklist of world Sphecidae).

*Pison tahitense* de Saussure, 1867:65, ♀, ♂. Lectotype: ♀, Otahiti, now Tahiti: no specific locality (NHMW), **present designation**, examined. **New synonym.** – F. Smith, 1869:291 (in checklist of *Pison*); Kohl, 1885:188 (in checklist of world *Pison*); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Kohl, 1908:309 (Samoa: Upolu; Papua New Guinea: Neupommern, now New Britain); R. Turner, 1916b:627 (diagnostic characters), 1919a:338 (Fiji); Cheesman, 1928:175 (Marquesas and Society Islands); Perkins and Cheesman, 1928:6 (listed from Samoa), 26 (Samoa, diagnostic characters); F. Williams, 1947:318 and 331 (Fiji); *nec* Krombein, 1949b:385 (in key to Sphecidae of Micronesia) = *Pison reichingeri*; Yasumatsu, 1953:135 (in list of *Pison* of Pacific islands), 146 (bibliographic references; Marshall Islands); Fullaway, 1957:279 (in checklist of Hymenoptera of Fiji); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Kami and Miller, 1998:57 (in checklist of Samoan insects); Evenhuis, 2007:6 (in checklist of Hymenoptera of Fiji); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia).

*Pison hospes* F. Smith, 1879a:676, ♀, ♂. Lectotype: ♀, Sandwich (now Hawaiian) Islands: no specific locality (BMNH), **present designation**, examined. **New synonym.** – Blackburn and Kirby, 1880:88 (Hawaiian Islands); Kohl, 1885:187 (in checklist of world *Pison*); Blackburn and Cameron, 1886:233 (Hawaiian Islands: Kauai, Maui, and Oahu); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); R. Perkins *in* R. Perkins and Forel, 1899:14 (Hawaiian Islands, Fiji); Turner, 1916b:628 (citation, distribution); Bridwell, 1919:123 (in key to Hawaiian *Pison*); Giffard, 1919:181 (American Samoa and Hawaii); Cheesman, 1928:175 (Marquesas and Society Islands); F. Williams, 1927:438 (nesting sites in Hawaii); Perkins and Cheesman, 1928:6 (listed from Samoa), 27 (Samoa); Swezey and Bryan, 1929:296 (Hawaii: Molokai Island); F. Williams, 1932:151 (Marquesas Islands); Krauss, 1944:93 (Hawaii: Molokai Island); F. Williams, 1947:318 and 331 (Fiji); Krombein, 1949b:385 (in key to Sphecidae of Micronesia), 404 (synonymy, Marshall and Palau Islands); Gibson-Hill, 1950:160 (Cocos Islands); Krombein, 1950:139

(Micronesia: Bikini); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 139 (bibliographic references; locality records from Micronesia); Fullaway, 1957:279 (in checklist of Hymenoptera of Fiji); Yoshimoto, 1960:334 (Hawaiian Islands); Krauss, 1961:417 (Cook Islands: Aitutaki Island); Hinckley 1969:15 (Tokelau Islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Tsuneki, 1982a:37 (Bismarck Archipelago), 1983a:95 (Philippines; redescription), 102 (in key to *Pison* of Philippines), 1983b:42 (in key to *Pison* of New Guinea), 43 (New Guinea); Kami and Miller, 1998:57 (in checklist of Samoan insects); Evenhuis, 2007:6 (in checklist of Hymenoptera of Fiji).

*Pison hospes* F. Smith, 1879b:139, ♀, ♂. Objective synonym of *Pison hospes* F. Smith, 1879a.

*Pison strenuum* Turner, 1916b:606, ♀, ♂. Lectotype: ♀, Western Australia: Yallingup (BMNH), **present designation**, examined. **New synonym**. – Turner, 1916b:597 (in key to Australian *Pison*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:262 (in catalog of Australian Sphecidae).

*Pison fraterculus* Turner, 1916b:610, ♀, ♂. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. **New synonym**. – Turner, 1916b:598 (in key to Australian *Pison*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

As *Psen fuscipenne* (corrected to *Pison hospes* by Krombein, 1949b:404); Yasumatsu, 1937b:131 (Carolina Islands: Palau Islands; redescription, description of ♂), 1939:83 (in key to eastern Asian *Pison*, in checklist of *Pison* of Japanese Empire).

*Pison paluense* Yasumatsu, 1937:133. Nomen nudum used in description of *Pison korrorense*. Synonymized with *Pison hospes* by Krombein, 1949b:404.

**LECTOTYPES DESIGNATION.**— F. Smith described *Pison marginatum* in 1856 and *Pison pallidipalpe* in 1873 from the female sex, but he did not mention the number of specimens examined. I have designated as lectotypes of these species, respectively, the only female of each present in The Natural History Museum, London.

*Pison tahitense* was described from an unspecified number of females and an unspecified number of males, although the males were associated with the females only questionably. I have seen an original female of de Saussure, preserved in NHMW, with the label “Novara 1857-59 Reise” and two additional labels “Type Saussure” and “*tahitense* Typ det. Saussure”. I have designated it as the lectotype of this species.

*Pison hospes* was described from an unspecified number of specimens, both females and males. I have seen an original female and a male preserved in the BMNH. Both are labeled “Sandw[ich] Is[lands]”, and the female bears additional labels “*Pison hospes* Sm. (Type)” and “BM Type Hym 21.589”. I have selected the female as the lectotype, and the male as the paralectotype.

The syntype series of *Pison strenuum* includes six females and six males from Yallingup, one female from Perth, and also one female from Yallingup that is actually *Pison congener*. I have designated as the lectotype of this species the female bearing the label “*Pison strenuum* Turn., Type” in Turner’s handwriting, and the other specimens (without determination labels) as the paralectotypes.

Turner described both sexes of *Pison fraterculus*, but he did not mention the number of specimens examined. Two females and one male, all from Mackay, are kept in The Natural History Museum, London. I have designated one female as the lectotype of *Pison fraterculus* and the other two specimens as paralectotypes.

**RECOGNITION.**— *Pison marginatum* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, the tegula largely impunctate and asetose, the propodeum with a longitudinal carina separating the dorsum and posterior surface from the side (carina evanescent in some specimens), the setae appressed on tergum I, the sterna punc-



tate throughout, and the gaster black in the vast majority of specimens (apical depressions of terga brown).

The female shares with *P. formicarium* the punctures at the center of the upper frons (between the upper end of the middle carina and the midocellus) at least one diameter apart, and the markedly microsculptured interspaces; a subsidiary recognition feature of the two species is the minutely punctate ventral half of the metapleuron, the punctures being markedly smaller than those of the adjacent parts of the mesopleuron and propodeum (Fig. 634). The females of the two species differ by the setae on the lower gena: in *P. marginatum* they are sinuous, as long as  $1.5 \times$  the midocellar diameter or more (at least some setae), whereas in *P. formicarium* they are straight, curved apically,  $1.0 \times$  as long as the midocellar diameter. In most females of *P. marginatum* the legs are all black (as they are in *P. formicarium*), but the femoral apex and the tibiae are ferruginous in some Australian specimens. Such individuals may be confused with *P. austrinum*, *P. modestum* and *P. varipes*, in which the punctures of the upper frons are also about one diameter apart. These species can be differentiated by the following: in *P. austrinum* all the legs are ferruginous, in *P. varipes* the fore and midtibiae are black, but the hindfemur, hindtibia, and the hindtarsus are ferruginous, and in *P. modestum* the frontal punctures are ill defined. *Pison punctifemur* is similar in having sparse punctures on the upper frons, but differs in having conspicuously large punctures on the posteroventral surface of the forefemur (Fig. 903).

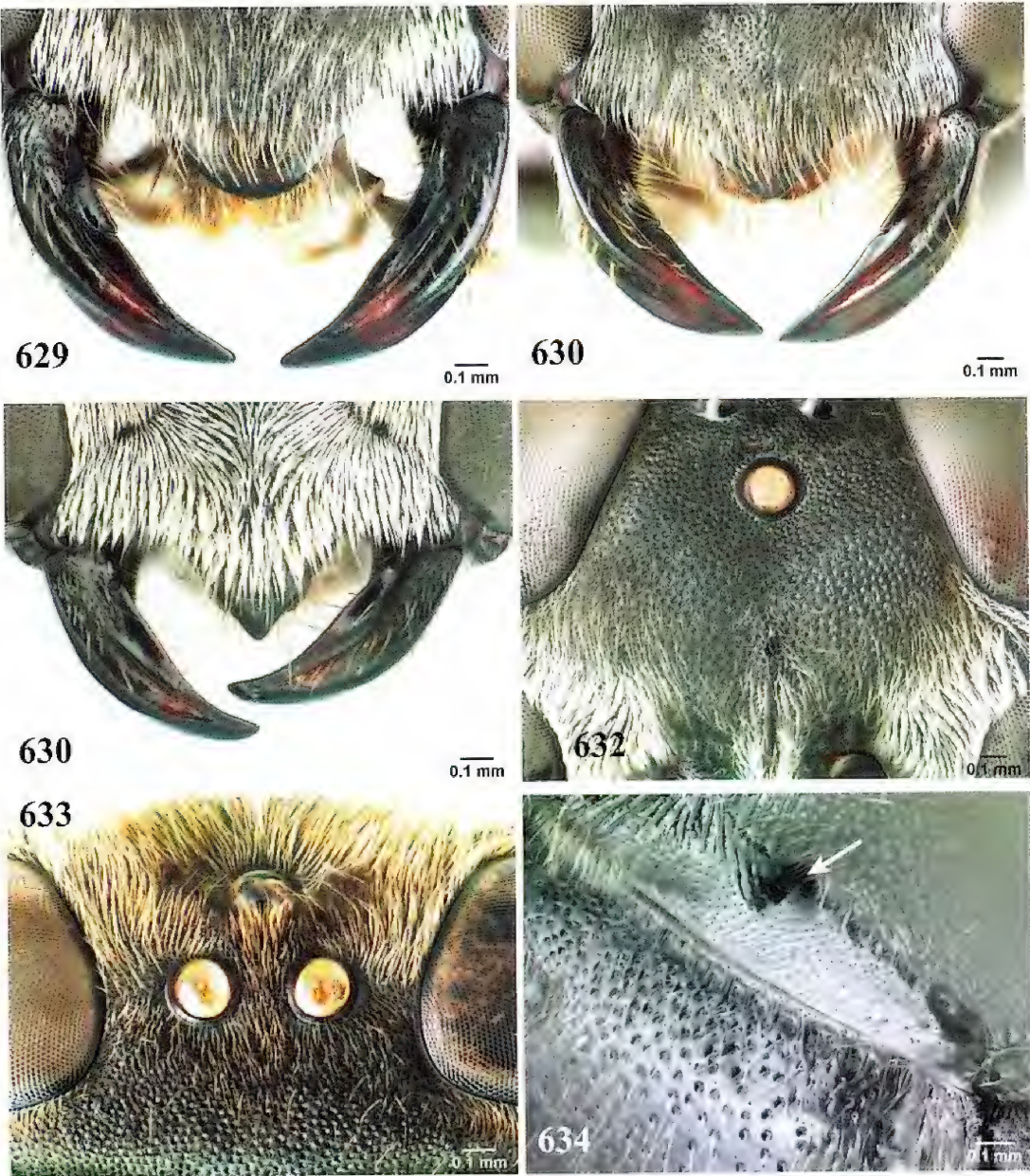
In the male, the most distinctive character is sternum VIII, whose apical margin is shallowly to moderately deeply emarginate and whose posterolateral corners are rounded (Fig. 635). In addition, the flagellomeres are cylindrical or nearly so, the dorsal length of flagellomere I is  $2.3-2.5 \times$  its apical width, the clypeal lamella is acutely angulate, with the lateral margin straight or nearly so, the ocellocular distance is about  $1.1-1.2 \times$  hindocellar diameter (Fig. 633) in Australian specimens, tergum VII is not carinate mesally and has a straight (or nearly so) apical margin, and sterna III and VII are simple. *Pison formicarium* is similar, but has the apicolateral corners of sternum VIII markedly narrower (almost sharply angulate), the punctures of the propodeal dorsum are more than one diameter apart adjacent to the spiracle, and the legs are all black; in *P. marginatum* the punctures of the propodeal dorsum are less than one diameter apart adjacent to the spiracle and in the Australian specimens the scutal punctures are less than one diameter apart and in many specimens the tibiae and tarsi are ferruginous (in specimens from New Guinea the scutal punctures are more than one diameter apart mesally and the legs are black). Unlike most other species occurring in the Pacific Islands, *P. marginatum* has sterna II-IV densely, uniformly punctate throughout (as has *P. ponape*). Unlike *P. ponape*, terga I-IV of *P. marginatum* have setose, silvery, apical fasciae (at most terga I and II in *P. ponape*), and the punctures of the upper frons are 1-2 diameters apart (rather than 2-3 diameters apart).

**JUSTIFICATION OF NEW SYNONYMY.**—The lectotype of *P. tahitense* de Saussure, 1867, and many conspecific specimens from various Pacific islands agree perfectly well with individuals of *P. marginatum* from Australia and New Guinea. Treated as a valid name for nearly 150 years, *P. tahitense* now becomes a junior synonym of the latter name.

The lectotypes of *P. pallidipalpe* and *P. hospes* are certainly conspecific with those of *P. marginatum* and of *P. tahitense*. These two names were also treated as valid for more than a century and fall into synonymy now.

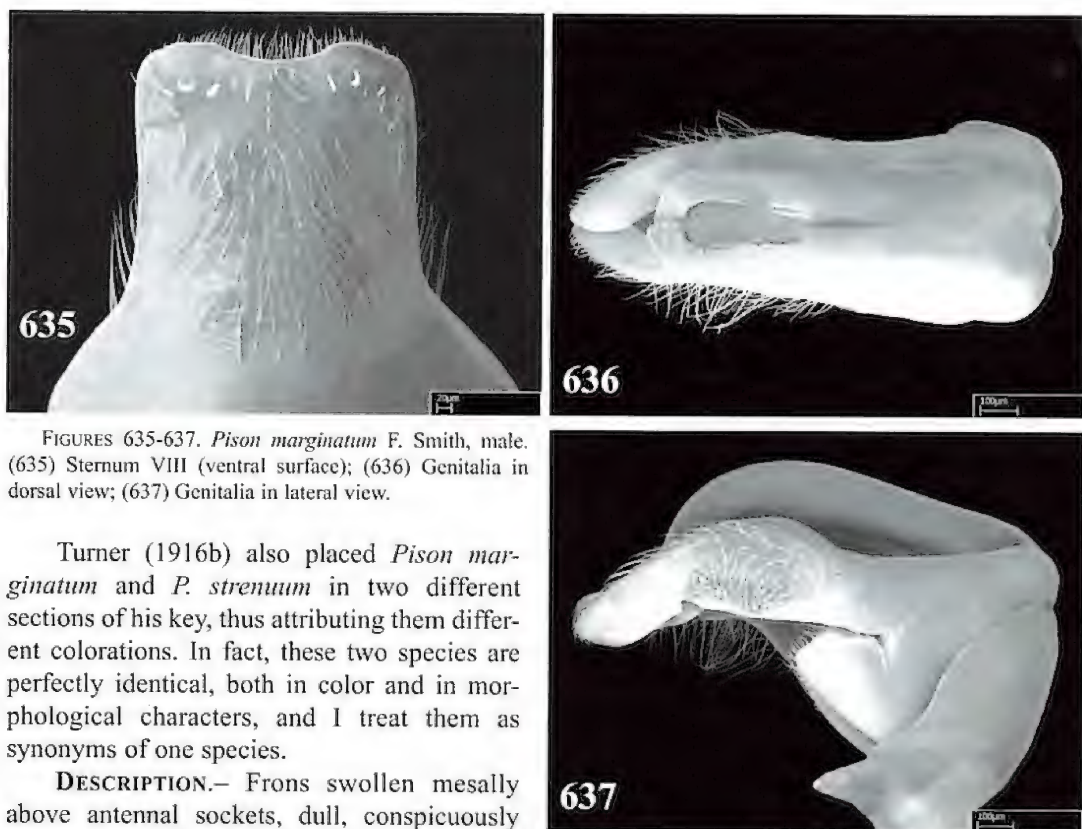
Turner (1916b), in his key, differentiated *Pison fraterculus* and *P. marginatum* by the color of the tibiae, ferruginous in the former and all black in the latter. Apparently he had only a limited material, one female and two males of the first species and one female of the second, and did not realize that the color of the tibiae is individually variable. As the lectotypes of the two perfectly agree in their morphological characters, I treat these names as synonyms of one species.





FIGURES 629-634. *Pison marginatum* F. Smith. (629) Clypeus and mandibles of female from Australia; (630) Clypeus and mandibles of female from New Guinea; (631) Male clypeus and mandibles; (632) Upper frons of female; (633) Male vertex; (634) Female metapleuron (arrow indicates upper metapleural pit).





FIGURES 635-637. *Pison marginatum* F. Smith, male. (635) Sternum VIII (ventral surface); (636) Genitalia in dorsal view; (637) Genitalia in lateral view.

Turner (1916b) also placed *Pison marginatum* and *P. strenuum* in two different sections of his key, thus attributing them different colorations. In fact, these two species are perfectly identical, both in color and in morphological characters, and I treat them as synonyms of one species.

**DESCRIPTION.**— Frons swollen mesally above antennal sockets, dull, conspicuously microsculptured; finely punctate, punctures superficial, in females from Australia averaging about one diameter apart at center of frons (above median carina), about two diameters apart in females from other regions, in male varying from more to less than one diameter apart (see Variation below). Gena narrow in dorsal view. Labrum shallowly emarginate mesally. Anteromedian pronotal pit transversely elongate, about  $1.0\text{--}1.5 \times$  as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, interspaces slightly microsculptured but shiny, varying in size (see Variation below). Tegula somewhat enlarged. Mesopleural punctures well defined, separated from each other, slightly less to more than one diameter apart near center in female, less than one diameter apart in male; interspaces unsculptured, shiny, not merging into carinae. Postspiracular carina present, about  $1.0\text{--}1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits; ventral half of metapleuron minutely punctate, punctures markedly smaller than those of adjacent parts of mesopleuron and of propodeum (Fig. 634). Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface but not attaining gastral socket area nor spiracle (carina evanescent in some specimens); dorsum in most specimens punctate and with oblique ridges, unridged along lateral longitudinal carina, but largely unridged (punctate only) in many specimens from Pacific Islands, with short oblique ridges emerging from middle carina; side with well-defined punctures, interspaces merging into fine ridges (unridged in single female from Northern Territory and some specimens from Solomon Islands); posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface with fine but well-defined punctures, punctures up to several diameters apart in female, slightly more than one diameter apart in male. Hindcoxal dorsum with outer margin carinate except anteriorly. Punctures of tergum I well defined, averag-

ing from about one to about two diameters apart on horizontal part mesally in female, about one diameter apart in male, about two to three diameters apart in specimens from Pacific islands. Sterna II-IV punctate throughout, punctures about 2-3 diameters apart on disk of sternum II, about 1-2 diameters on its apical depression, about 1-2 diameters apart on sternum IV.

Setae silvery except dark brown on scutum, golden on frons and clypeus in some specimens from Australia, suberect on upper frons (erect in occasional specimens), about as long as  $1.0 \times$  midocellar diameter, suberect and sinuous on lower gena, about  $1.5 \times$  as long as midocellar diameter (about  $1.0 \times$  midocellar diameter in some males), appressed on tergum I; scutal setae suberect, about as long as  $0.5 \times$  midocellar diameter; setae not concealing integument on clypeus in female, largely concealing it (except lamella) in male. Apical depressions of terga with setal fasciae, fasciae silvery or with golden tinge in Australian specimens, silvery in those from New Guinea and Pacific Islands.

Head, thorax, propodeum, and gaster black (terga I and II partly ferruginous in one male from Coolbaggie Forest Reserve, New South Wales), apical depressions of terga (except basal ones) brown in many specimens, in many females from Australia clypeal lip and mandible mesally dark reddish. Antenna all black in most specimens, but pedicel, scape, and flagellomeres I-III ferruginous in two females from Bald Hill area, Queensland. Legs black in many Australian females, but femoral apex and tibiae ferruginous in some, varying from all black to all ferruginous in males; all black in specimens from New Guinea and the Pacific islands. Wings moderately infumate.

♀.—Upper interocular distance equal to  $0.66-0.70 \times$  lower interocular distance in specimens from Australia and New Guinea,  $0.56-0.58 \times$  in specimens from the Pacific islands; ocellocular distance equal to  $0.6-1.2 \times$  hindocellar diameter in specimens from Australia and New Guinea,  $0.5-0.6 \times$  in those from Pacific islands, distance between hindocelli equal to  $0.9-1.5 \times$  hindocellar diameter; eye height equal to  $0.92-1.04 \times$  distance between eye notches. Upper frons, between upper end of the middle carina and the midocellus, with punctures about one diameter apart, interspaces markedly microsculptured (Fig. 632), and all setae suberect and oriented ventrally. Free margin of clypeal lamella varying from roundly triangular or arcuate to sharply angulate (see Variation below). Dorsal length of flagellomere I  $2.5-3.0 \times$  apical width, of flagellomere IX  $1.4-1.8 \times$  apical width. Mandible: trimmal carina finely incised at about midlength. Length 9.5-11.7 mm; head width 2.8-3.2 mm.

♂.—Upper interocular distance equal to  $0.78-0.80 \times$  lower interocular distance in specimens from Australia and New Guinea, to  $0.66-0.70 \times$  in those from Pacific islands; ocellocular distance equal to  $1.1-1.2 \times$  hindocellar diameter in specimens from Australia and New Guinea (Fig. 633), to  $0.8 \times$  hindocellar diameter in those from Pacific Islands, distance between hindocelli equal to  $0.8-1.1 \times$  hindocellar diameter; eye height equal to  $0.92-1.04 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 631). Dorsal length of flagellomere I  $2.3-2.5 \times$  apical width in specimens from Australia and New Guinea,  $2.7-2.8 \times$  apical width in those from Pacific islands, of flagellomere X  $1.2-1.4 \times$  apical width. Sternum VIII with apical margin shallowly to moderately deeply emarginate and with posterolateral corners rounded (Fig. 635). Genitalia: Figs. 636, 637. Length 7.5-12.6 mm; head width 2.2-3.2 mm.

**GEOGRAPHIC VARIATION.**—In the vast majority of specimens from Australia, the scutal punctures are less than one diameter apart (several punctures near the scutum center up to 2-3 diameters apart in females from Stirling National Park, Western Australia and some from Bowling Green Bay National Park, Queensland), the clypeal lamella in the female is roundly triangular or arcuate (Fig. 629), but sharply angulate in some females from Bowling Green Bay National Park, and the punctures of the male frons vary from slightly more to less than one diameter apart. In specimens from New Guinea and Solomon Islands, the punctures of the scutal disk average more than one



diameter apart, the clypeal lamella of most females is sharply angulate (Fig. 630), and in the male the frons punctures average more than one diameter apart. In specimens from the Pacific islands, most scutal punctures are one diameter apart or less, but many punctures on disk are up to 3 diameters apart; in most females, the free margin of clypeal lamella is obtusely angulate, but acutely angulate in some.

**NESTING HABITS.**—Williams (1927) noted that this species (as *P. hospes*) is “not uncommon at middle elevations in the mountains [of Hawaiian Islands], sometimes modifying old *Sceliphron* nests on rocky banks to suit its needs”. Evans, Matthews, and Hook (1981) noted two generations of this species in the Canberra, A.C.T. area. They studied three nests extracted from trap nests in that area. The nests had from four to seven cells, measuring from 12 to 19 mm in length and separated by mud partitions 1–2 mm thick. Two of the nests were closed off by thick mud plugs, 17–18 mm thick, the third had an empty vestibular cell 30 mm long, closed off by a thin plug that was recessed 7 mm from the nest entrance. The last nest was supplied with small spiders, five to nine per cell. Four of the cells contained wasp eggs, in each case laid longitudinally in the spider’s opistosoma close to the nest entrance, suggesting that it was laid on the last spider placed in the cell. The spiders were *Gea theridioides* (L. Koch), *Araneus lutulentus* (Keyserling), both araneids, and *Oxyopes elegans* L. Koch, an oxyopid. Gibson Hill (1950) observed juvenile *Nephila imperatrix* L. Koch, now *N. edulis* (Labillardière), a member of Nephilidae, as prey of *Pison marginatum* (as *P. hospes*) on the Cocos Islands.

**GEOGRAPHIC DISTRIBUTION** (Figs. 638, 639)—Australia, Island of New Guinea, Singapore, Indonesia, Malaysia: Sabah, Philippines, and many Pacific islands (American Samoa, Caroline Islands, Cocos Islands, Cook Islands, Federated States of Micronesia, French Polynesia, Fiji, Hawaiian Islands, Kiribati, Mariana Islands, Marshall Islands, New Britain, New Caledonia, Palau, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Wake Island).

**RECORDS.**—AMERICAN SAMOA: Swains Island: no specific locality (1 ♀, BISH). Tutuila Island: Aunu’u Island (7 ♀, BISH), Fagaitua (1 ♀, BISH), Fagasa (1 ♀, BISH), Fagatogo (1 ♀, BISH), Leone Aulau (1 ♀, BISH), Leone Aule (1 ♀, BISH), Reservoir – Fagatoga Trail (1 ♀, BISH), Vailoatai (1 ♀, BISH), no specific locality (1 ♀, BISH).

**AUSTRALIA:** Australian Capital Territory: Black Mountain (2 ♀, 1 ♂, ANIC), Canberra (10 ♀, 6 ♂, ANIC; 1 ♀, 1 ♂, BMNH), Murrumbidgee River near Canberra (5 ♀, 2 ♂, ANIC). Christmas Island: The Settlement at 10°25’S 105°41’E (1 ♀, ANIC). New South Wales: Armidale (1 ♀, QMB), Ballina (1 ♀, AMS), Bellbrook (1 ♂, AMS), Bendalong (1 ♀, AMS), 6 km NE Bilpin (1 ♀, AMS), Blackdown (1 ♀, AMS), Bronte (1 ♂, AMS), Clarence (3 ♀, AMS), Congo 8 km ESE Moruya at 35°58’S 150°09’E (1 ♀, ANIC), Coolbaggie Forest Reserve 10 km E Eumungerie at 31°58.5’S 148°40.5’E (1 ♀, 4 ♂, CAS), Copper Hills (1 ♀, SAM), Epping (3 ♀, 1 ♂, AMS), Forest Reefs (1 ♂, SAM), Fowlers Gap Research Station at 31°05’S 141°42’E (9 ♀, 2 ♂, ANIC), Gilgandra (1 ♂, AMS), Gilgandra Flora Reserve at 31°39.7’S 148°46.3’E (2 ♀, 1 ♂, CAS), Haystack Ridge near Mount Tomah (1 ♀, AMS), Hunter River (1 ♀, BMNH, lectotype of *Pison marginatum*), Kamay Botany National Park 14 km S center of Sydney at 34°00.3’S 151°13.2’E (1 ♀, CAS), Katoomba at 33°43.7’S 150°18.9’E (1 ♂, CAS), Kinchega National Park at 32°23.7’S 142°22.7’E (2 ♂, CAS), 0.5 km SE Lansdowne near Taree (1 ♂, ANIC), Lord Howe Island at 31°31’37’’S 159°03’58’’E (1 ♀, 1 ♂, AMS), Manly: Kangaroo Park (2 ♀, 1 ♂, ANIC), Moree (1 ♀, ANIC), Mount Kaputar National Park at 30°15.8’S 150°03.3’E (2 ♀, 1 ♂, CAS) and at 30°16.2’S 150°06.1’E, 900 m (1 ♂, CAS), Mount Tomah (4 ♀, 1 ♂, AMS), 16 km N Mudgie (1 ♀, ANIC), Myalla Tank at 31°50’S 141°57’E (1 ♂, AMNH), Nadgee Nature Reserve S Newton’s Beach (11 ♀, 1 ♂, ANIC), Narrabri (1 ♀, BMNH), 40.5 km SW Narrabri at 30°37.7’S 149°34.1’E (2 ♂, CAS), North Kurrajong (1 ♀, AMS), Orange Botanic Gardens at 33°15.3’S 149°05.7’E (3 ♀, 1 ♂, CAS), 4 km W Sunny Corner at 33°22.7’S 149°51.6’E (20 ♀, 21 ♂, CAS), Sydney (2 ♀, AMS; 1 ♂, BMNH), Sydney: Grotto Point (1 ♀, AMS), Warrenburg National Park (1 ♂, UCD), Warrumbungle National Park at 31°16.9’S 148°59.1’E (2 ♀, 8 ♂, CAS), Warrumbungle National Park: Pincham Camp (4 ♀, 2 ♂, ANIC), near Warrumbungle National Park at 31°16.9’S 149°04.8’E (7 ♀, 6 ♂, CAS), Whiskers 7 km WNW Hoskinstown



FIGURE 638. Collecting localities of *Pison marginatum* F. Smith (western section).

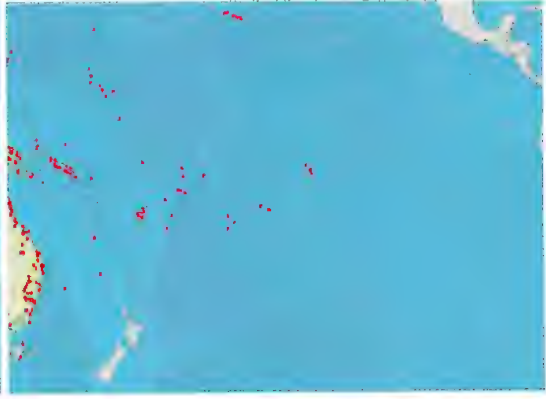


FIGURE 639. Collecting localities of *Pison marginatum* F. Smith (eastern section).

at 35°24'S 149°23'E (2 ♀, 1 ♂, ANIC), Willoughby (1 ♀, AMS), Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E (2 ♀, 4 ♂, CAS), Woronera River at Engadine (1 ♀, AMS). **Norfolk Island:** Bloody Bridge (1 ♂, RMNH), near Cook monument (1 ♀, RMNH), Kingston (4 ♀, 1 ♂, BISH), Phillip Island at 29°07'S 167°57'E (1 ♀, CAS). **Northern Territory:** Holmes Jungle on the outskirts of Darwin (1 ♀, NTM). **Queensland:** Annan River 3 km SW Black Mountain at 15°41'S 145°12'E (1 ♀, ANIC), 11 km NW Bald Hill at 13°44'S 143°20'E (1 ♀, ANIC), 15 km WNW Bald Hill at 13°43'S 143°19'E (1 ♀, ANIC), 4 km NE Batavia Downs at 12°39'S 142°42'E (2 ♀, ANIC), Biggenden: Degilgo River (1 ♀, ANIC), 15 km SW Biggenden (1 ♀, ANIC), Bluff Range S Biggenden (1 ♀, ANIC), Bowling Green Bay National Park at 19°26.0'S 146°56.7'E (6 ♀, CAS), Brisbane: Bardon (1 ♂, BMNH), Brisbane: Blunder Creek (1 ♀, QMB), Brisbane: Botanic Gardens at 27°28.8'S 152°58'E (1 ♀, CAS), Brisbane: Indooroopilly (2 ♀, BMNH), Brisbane: Mount Coot-tha (4 ♂, CAS), Brookfield (3 ♂, BMNH), Burdekin River 20 km NE Charters Towers at 20°00.1'S 146°26.3'E (1 ♂, CAS), Carnarvon National Park (1 ♂, QMB), Coast Range via Biggenden 13 mi. N Cooma (1 ♀, CAS), Crater Lakes National Park SW Biggenden (2 ♀, ANIC), Crediton State Forest at 21°11.7'S 148°29.9'E (1 ♀, 2 ♂, CAS) and 21°11.9'S 148°29.9'E (3 ♀, 2 ♂, CAS), Daintree village at 16°15'00"S 145°19'06"E (1 ♀, AMNH), Degilgo River near Biggenden at 25°30'S 152°02'E (1 ♀, ANIC), 9 km S Dingo Beach at 20°05.5'S 148°30.2'E (1 ♀, 2 ♂, CAS), Electra State Forest ca 25 km S Bundaberg (2 ♂, ANIC), Emerald (1 ♀, ANIC; 1 ♀, BMNH), Eungella at 21°07.6'S 148°29.7'E (1 ♀, CAS), Eungella National Park at 21°10.5'S 148°30.3'E (5 ♀, 7 ♂, CAS; 1 ♂, QMB), George Creek Station 27.5 km W Black Braes Homestead at 19°32'53"S 143°56'33"E (1 ♀, AMS), Great Palm Island (1 ♀, RMNH), Gunshot Creek in Cape York Peninsula at 11°45'S 142°28'E (2 ♀, ANIC; 2 ♀, CAS), Hastings Creek ca 15 km S Biggenden (1 ♂, ANIC), Heathlands at 11°45'S 142°35'E (2 ♀, ANIC), 12 km SSE Heathlands at 11°51'S 142°38'E (1 ♀, 1 ♂, ANIC), Helenvale (1 ♀, AMS), Homevale National Park at 21°26.9'S 148°32.4'E (9 ♀, 3 ♂, CAS), Kuranda (1 ♀, BMNH), Lake Broadwater 28 km S Dalby (1 ♀, ANIC), Lake Monduran at 24°52.1'S 151°51.0'E (1 ♀, CAS), Lamington National Park at 28.216°S 153.152°E (1 ♀, RMNH), 5 km NE Leyburn (1 ♂, CAS), Lockerbie Scrub at 10°46'S 142°30'E (1 ♀, ANIC), Mackay (2 ♀, 1 ♂, BMNH, lectotype and paralectotypes of *Pison fraterculus*, also 1 ♂, BMNH), 60 km N Marlborough (1 ♂, AMS), Middle Claudie River in Iron Range (2 ♀, AMS), Mossman (1 ♀, QMB; 1 ♀, RMNH), Mount Coolum National Park 25 km N Caloundra at 26°30'S 152°05.3'E (1 ♂, CAS), Mount Moffat National Park (1 ♀, QMB), 3 km NE Mount Webb at 15°03'S 145°09'E (1 ♀, ANIC), Mulgrave River (3 ♀, CAS), Mungumby Lodge near Helenvale (4 ♀, AMS), Murray Island (1 ♀, AMS), North Stradbroke Island at 27°30.3'S 153°34.6'E (1 ♀, CAS), Peach Creek Crossing 25 km NNE Coen (3 ♀, 1 ♂, ANIC; 2 ♀, SAM), Penrith Island (1 ♀, AMS), Plunkett near Mount Tamborine (1 ♀, AMS), Rainforest CRC [= Cooperative Research Centre] at 16° 06'16"S 145°26'58"E (1 ♀, AMNH), Ravenshoe (2 ♀, 1 ♂, AMS), 18 km S Ravenshoe (2 ♂, AMS), 2 km N Rokeby at 13°39'S 142°40'E (1 ♀, ANIC), 61 km S Rolleston at 24°59.7'S 148°27.8'E (2 ♀, 4 ♂, CAS), Split Rock 14 km SE Laura at 15°39'S 144°31'E (2 ♀, ANIC), Tamborine Mountain (1 ♂, BMNH), 11 km S Townsville at 19°21.8'S 146°53.2'E (1 ♂, CAS), 55 km NW Townsville (1 ♀, RMNH), Wenlock River at Moreton in Cape York Peninsula (2 ♀, ANIC, CAS), Wonga



Beach 11 km NNE Mossman at 16°19.9'S 145°25.3'E (1 ♀, CAS), Woodgate 35 km E Childers (1 ♀, AMS). **South Australia:** Adelaide (1 ♂, BMNH), Adelaide: Brooklyn Park (1 ♀, 2 ♂, SAM), Athelstone near Adelaide (1 ♀, SAM), Bullinina Dam 45 km NE Marree (1 ♀, SAM), Corny Point (1 ♀, SAM), Dingly Dell Camp on Oraparina Creek at 31°21'S 138°42'E (1 ♀, 1 ♂, ANIC), Gammon Ranges National Park: Arcoona Creek (1 ♀, SAM), Kangaroo Island: Gosse area (1 ♂, BMNH), 49.5 km S Kimba at 33°31.7'S 136°29.8'E (10 ♀, 3 ♂, CAS), Kings Mill Creek near Arkaroola (3 ♂, SAM), Mitcham near Adelaide (7 ♀, SAM), Muloorina Station near Lake Eyre South (1 ♀, SAM), 5 km S Mylor (2 ♀, 6 ♂, BMNH), Orroroo (1 ♀, SAM), Stenhouse Bay (1 ♀, ANIC), Trezona Camp at Brachina Creek at 31°20'S 138°37'E (2 ♂, ANIC), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (69 ♀, 50 ♂, CAS; 2 ♀, UCD), 3 km ENE Wilpena at 31°31.0'S 138°36.6'E (94 ♀, 34 ♂, CAS), Wilpena Pound Gap at 31°33'S 138°36'E (21 ♀, ANIC), 30 km N Wilpena (1 ♂, UCD), 34 km S Wilpena (1 ♂, UCD). **Tasmania:** Mount William National Park at 40°52'S 148°10'E (1 ♀, QMB), Pittwater (1 ♀, 1 ♂, ANIC). **Victoria:** Gunbower (1 ♀, BMNH), Rosanna, a suburb of Melbourne (1 ♀, CAS). **Western Australia:** Billy Well Creek 20 km NE Mount Sandiman (1 ♀, WAM), Charnley River 2 km SW Rolly Hill at 16°22'S 125°12'E (2 ♀, ANIC), 10 km W Cobra Station at 24°10.2'S 116°23.0'E (5 ♀, 2 ♂, ANIC; 2 ♀, 3 ♂, CAS), Dongarra (10 ♀, 13 ♂, BMNH), Fitzgerald River National Park at 33.949416°S 119.926086°E (1 ♀, MNKB), Glenbourne Farm near Margaret River (1 ♀, WAM), Irwin River at Strawberry Station 19 km W Mingenew (1 ♀, 5 ♂, CAS), Manjimup (1 ♀, UCD), 30 km E Marble Bar at Yandicoogina Creek at 21°11.0'S 120°01.7'E (1 ♀, 1 ♂, CAS), 4 km SW Mining Camp on Mitchell Plateau at 14°52'S 125°50'E (1 ♀, ANIC), Moora (1 ♂, UCD), Mount Augustus National Park 24°21.9'S 116°52.2'E (1 ♀, CAS), Perth (2 ♀, BMNH, including paralectotype of *Pison strenuum*), Perth: Darlington (6 ♀, WAM), Ravensthorpe (1 ♀, BMNH), Rottnest Island (1 ♀, WAM), Stirling Range National Park at 34°25.3'S 117°47.2'E (5 ♀, 6 ♂, CAS), 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E (1 ♂, CAS), 7 km N Wongawol Homestead (1 ♀, WAM), Yallingup (6 ♀, 6 ♂, BMNH, lectotype and paralectotypes of *Pison strenuum*; 1 ♀, UCD), Yanchep (7 ♀, 2 ♂, BMNH).

**COCOS ISLANDS:** Direction Island (1 ♂, ANIC), West Island (4 ♀, 5 ♂, ANIC).

**COOK ISLANDS:** Aitutaki Atoll: Aitutaki (1 ♀, BISH). **Atiu Island:** no specific locality (1 ♀, BISH).

**Motu Ko Island:** no specific locality (2 ♀, BISH). **Rarotonga Island:** no specific locality (1 ♀, 1 ♂, BISH).

**FEDERATED STATES OF MICRONESIA:** Yap Island (Yasumatsu, 1953): Guilifex – Nif, Guilifex – Rul, Rul.

**FIJI** (Williams, 1947, or as indicated): **Lau Islands:** Mago Island: Marona. **Oneata Island:** Dakuiloa. **Viti Levu:** Bau, Lami, Nadi (as Nandi), Nandarivatu, Natovi (Turner, 1919a, as Natova), Rewa, 10 km E Sigatoka (1 ♀, 3 ♂, CAS), Suva (1 ♀, BISH), Vunidawa.

**FRENCH POLYNESIA:** **Marquesas Islands** (Cheesman, 1928; F. Williams, 1932): Fatu-hiva: Omoa, Teatapu; Hiva-oo: Aimoa, Tahauku; Nuku-hiva; Tahuata: Hanamiai Valley, Hanateio Valley, Pahukea Ridge. **Society Islands** (Cheesman, 1928 or as indicated): Bora Bora: no specific locality, Raiatea; Tahiti: Vallée de Sainte Amélie, Vallée Vaitepiha, no specific locality (1 ♀, NHMW, lectotype of *Pison tahitense*).

**HAWAIIAN ISLANDS:** **Kauai:** no specific locality (Blackburn and Cameron, 1886). **Lanai:** Maunalei (1 ♀, 1 ♂, BISH). **Mau:** Haiku (21 ♀, BISH), Kaupo (1 ♀, ♂, BISH), Wailuku (4 ♂, CAS). **Molokai:** Kainakakai (Krauss, 1944), Kainalu region (Swezey and Bryan, 1929). **Niihau:** no specific locality (21 ♀, BISH). **Oahu:** Honolulu (1 ♀, USNM), Kahaluu (1 ♀, 1 ♂, BISH), NW Koolau (1 ♀, USNM), Malamalama (1 ♀, CAS), Pupukea (1 ♀, CAS). **No specific locality:** 1 ♀, 1 ♂, BMNH, lectotype and paralectotype of *Pison hospes*.

**INDONESIA:** **Ambon:** Mount Salahutu (1 ♀, RMNH), no specific locality (14 ♀, 4 ♂, RMNH), Waai (4 ♀, 1 ♂, BISH). **Bali:** Medewi (1 ♀, RMNH), no specific locality (3 ♀, CAS). **Halmahera:** road Payahe-Weda (1 ♀, RMNH). **Java:** Ambarawa (3 ♀, RMNH), Bogor (6 ♀, RMNH, as Buitenzorg), Garut (1 ♀, RMNH, as Garoet), Jakarta (1 ♀, 1 ♂, RMNH, as Batavia), Semarang (1 ♀, RMNH, as Samarang), Sukabumi (1 ♂, RMNH, as Soekaboemi), Surabaya (1 ♂, RMNH, as Soerabaya), no specific locality (2 ♀, RMNH). **Lombok:** Suranadi (1 ♀, BISH). **Seram:** 9 km E Wahai (1 ♀, RMNH). **Sulawesi:** Marinsow (1 ♂, RMNH), Parepare (1 ♀, RMNH, as Paré), Pendolo at Lake Poso (1 ♀, RMNH). **Sumatra:** Kuala Simpang (1 ♀, RMNH), no specific locality (3 ♂, AMNH; 1 ♀, RMNH). **Ternate:** Buku Konora (1 ♀, RMNH). **Western Papua** (= Indonesian New Guinea): Bernhard Camp [valley of Idenburg River, now Taritatu River, at dead end river branch] (1 ♀, RMNH), Bokondini 40 km N Baliem Valley (1 ♀, BISH), Eramboe 80 km from Merauke (1 ♀, BISH), Fak Fak Agricultural Station (1 ♀, BISH), Genjam 40 km W Jayapura (1 ♀, BISH), Hol Maffin 22 km E Sarmi (1 ♀, BISH), Jayapura (1 ♂, BISH; 3 ♀, 1 ♂, RMNH, as Hollandia), Kota Nica near

Jayapura (1 ♀, RMNH), Maffin Bay (2 ♀, 1 ♂, CAS), no specific locality (1 ♂, CAS), Nabire (1 ♂, BISH), Tor River (mouth) 4 km E Hol Maffin (4 ♂, BISH), Yapen Island (2 ♀, BISH, as Japen).

**KIRIBATI: Gilbert Islands:** Bairiki Island (1 ♂, BISH), Tarawa Atoll: Abaokoro (1 ♀, BISH), Bikanibeu (1 ♀, BISH). **Tabuaeran (= Fanning) Island:** no specific locality (2 ♀, CAS).

**MALAYSIA: Sabah:** Tuaran (1 ♀, CAS).

**MARIANA ISLANDS** (Yasumatsu, 1953 or as indicated): **Guam:** Agana Springs (1 ♀, BISH), Yigo (1 ♀, BISH). **Saipan Island:** Chalan Kanoa, Fanagam, Garapan – Sadog Tasi, no specific locality (1 ♀, BISH).

**MARSHALL ISLANDS:** **Ailinglaplap Atoll:** Ailinglaplap Island (2 ♂, BISH), Bigatyelang Island (5 ♀, 2 ♂, BISH). **Bikini Atoll** (1 ♂, USNM)). **Jaluit Atoll** (Krombein, 1949b). **Majuro Atoll:** Uliga Island (1 ♀, 2 ♂, BISH). **Namorik Atoll:** Namorik Island (1 ♀, BISH). **Namu Atoll:** Kagin Island (1 ♀, BISH). **Ujae Atoll:** Ujae Island (1 ♀, BISH). **Wotho Atoll** (1 ♀, BISH).

**NEW CALEDONIA:** Nouméa: Anse-Vata Beach (2 ♀, ANIC).

**PALAU REPUBLIC:** Babeldaob Island: Marukyoku, Arukorum – Ngaraudo, Narasumao – Ngardok, Ngarmisukan – Ngardok. Also: Airai Island (Krombein, 1949b), Angaur Island (1 ♂, BISH), Auluptagel Island (1 ♀, BISH), Koror (5 ♀, BISH).

**PAPUA NEW GUINEA: Bougainville Province:** Bougainville Island: Buin (1 ♂, BISH), New Britain: Vunabakan 10 km E Keravat (1 ♂, BISH). **Central Province:** Brown River (1 ♀, SAM). **Chimbu (= Simbu) Province:** Karimui (2 ♀, BISH). **Eastern Highlands Province:** Karimui (1 ♂, BISH). **East Sepik Province:** Maprik (1 ♂, BISH). **Madang Province:** Baiteta 12 km NW Alexishaven at 5°00'S 145°45'E (2 ♀, CAS), 3 km W Brahman Catholic Mission at 6°45'S 145°21'E (1 ♂, CAS), Duru 15 km SW Madang at 5°20'S 145°43'E (2 ♂, CAS), Gogol River 12 km SW Madang at 5°20'S 145°42'E (7 ♀, 4 ♂, CAS), 4 km S Hatzfeldhaven at 4°25'S 145°13'E (1 ♀, CAS), Kevasop village on Karkar Island (1 ♂, CAS), Kurum village on Karkar Island (1 ♀, BISH), Long Island: Malala Cove on shore on Lake Wisdom at 5°S 147°E (1 ♀, 1 ♂, ANIC); Madang (as Friedrich-Wilhelmshaven, 1 ♀, MTM, determined as *hospes* by Tsuneki), Malolo of Madang 15 km N Alexishaven at 5°29'S 145°47'E (3 ♀, 4 ♂, CAS), Nagada Harbor 8 km N Madang at 5°09'S 145°48'E (2 ♀, 3 ♂, CAS), Nobonob Hill 7 km NW Madang at 5°10'S 145°45'E (11 ♀, 9 ♂, CAS), Sapi Forest Reserve 30 km W Madang at 5°12'S 145°30'E (18 ♀, 26 ♂, CAS), Tapo Creek 26 km SW Madang at 5°24'S 145°38'E (8 ♀, CAS). **Milne Bay Province:** Milne Bay (1 ♀, 1 ♂, BISH), Normanby Island: Wakaiuna (1 ♂, BISH). **Morobe Province:** Bulldog Road (1 ♂, BISH), Etep (1 ♀, BISH), Simbang (1 ♀, MTM, determined as *P. hospes* by Tsuneki), Ulap (1 ♀, BISH), Wau (14 ♀, 3 ♂, BISH; 1 ♂, RMNH). **National Capital District:** Port Moresby (1 ♀, CAS; 1 ♀, RMNH). **New Britain:** Gazelle Peninsula (Kohl, 1908), Rabaul (1 ♀, AMS), Tabar Island (1 ♀, RMNH). **West Sepik Province:** Krisa (1 ♀, SAM), Torricelli Mountains (2 ♀, SAM). **Western Province:** Oriomo (1 ♀, BISH).

**PHILIPPINES** (Tsuneki, 1983a): **Cebu:** Argao. **Luzon:** Pangsanjan. **Mindanao:** Cagayan de Oro, Davao, Mount Apo, Zamboanga. **Samar:** Basey.

**SAMOA:** **Savaii Island:** no specific locality (1 ♂, RMNH). **Upolu Island:** Apia (1 ♀, USNM), Mulivai (1 ♀, BISH), Tapatapao (Yasumatsu, 1953), no specific locality (Kohl, 1908; Perkins and Cheesman, 1928).

**SINGAPORE** (Turner, 1916b).

**SOLOMON ISLANDS: Barrio Island:** Marovo Lagoon (1 ♀, 1 ♂, RMNH). **Choiseul Island:** Kolombangara River (1 ♀, BISH). **Gananga Island:** no specific locality (2 ♀, 1 ♂, RMNH). **Gananga Island** (1 ♀, RMNH); **Ghizo Island:** Gizo (3 ♀, BISH), no specific locality (1 ♂, CAS; 2 ♀, RMNH). **Guadalcanal:** Honiara (2 ♀, 4 ♂, BISH; 1 ♀, BMNH), Kukum (1 ♀, BMNH), Lavoro Plantation (1 ♀, AMS), bridge over Lunga River (2 ♀, BISH), Lungga Estate (1 ♀, 4 ♂, RMNH), Mount Gallego (1 ♀, BMNH), and Tenaru River (1 ♀, 1 ♂, CAS), Paripao (2 ♀, BISH), Guadalcanal and Florida Islands (4 ♀, CAS), no specific locality (2 ♀, AMS; 1 ♀, BISH). **Kolombongara Island:** no specific locality (1 ♀, RMNH). **Malaita Island:** Auki (1 ♀, BISH), Dala (2 ♂, BISH). **New Georgia Island:** Munda (1 ♀, BISH), no specific locality (1 ♀, RMNH). **Nggela Islands:** no specific locality (3 ♀, 3 ♂, RMNH, as Gela). **Ranontga Island:** no specific locality (1 ♀, RMNH). **Russell Islands:** no specific locality (1 ♀, RMNH). **San Cristobal Island:** Kira-Kira (4 ♀, BISH). **Santa Cruz Island:** Graciosa Bay (1 ♂, BISH). **Santa Isabel Island:** Buala (2 ♀, BISH). **Shortland Island:** no specific locality (1 ♂, RMNH). **Tulagi Island:** Sasapi cutting (1 ♀, BISH), no specific locality (17 ♀, 12 ♂, RMNH). **Vella Lavella Island:** no specific locality (1 ♀, RMNH). **No specific locality:** (1 ♀, 1 ♂, BISH).



TOKELAU ISLANDS: Fakaofu (1 ♀, BISH).

TONGA: Niuafo'ou Island: Kolofu'ou (1 ♀, UCD). Tongatapu Island: Nuku'alofa (1 ♂, BISH). Vavau Island: Neiafu (1 ♂, BISH), Toulā (1 ♀, 1 ♂, BISH).

TUVALU ISLANDS: no specific locality (Perkins and Cheesman, 1928, as Ellis Island).

WAKE ISLAND: no specific locality (2 ♂, BISH).

*Pison melanocephalum* Turner

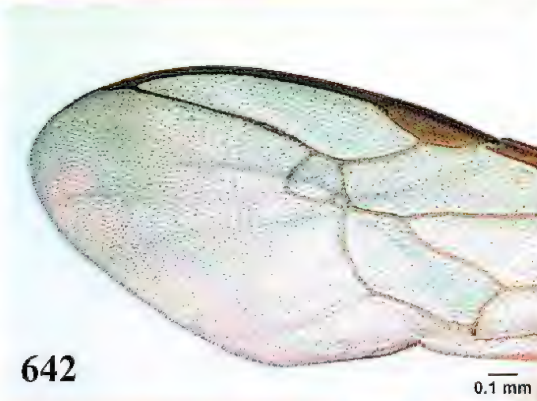
Figures 640-644

*Pison melanocephalum* Turner, 1908:515, ♀. Lectotype: ♀, Australia: Queensland: Cairns (BMNH), **present designation**, examined. — Turner, 1916b:596 (in key to Australian *Pison*), 601 (recognition characters); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:260 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Turner did not specify the number of the specimens examined in the original description of *Pison melanocephalum*. I have selected as the lectotype of this species the specimen with Turner's identification label preserved in the Natural History Museum, London.

**RECOGNITION.**— Like many *P. amabile*, *P. melanocephalum* has a ferruginous thorax, propodeum, legs, and gaster, only the head being black, and its tergum I is sloping gently toward the base (Fig. 642), much less than in most other *Pison*. It differs from *P. amabile* in having the head globose in dorsal view (Fig. 641) rather than transverse, the antennal socket almost reaching the eye margin (rather than separated by about  $1.5 \times$  socket width), the mandibular apex simple (rather than tridentate in the female and bidentate in the male), the tegula punctate throughout (rather than largely impunctate), the first recurrent vein joining the first submarginal cell far away from the first intersubmarginal vein (Fig. 642) rather than next to it, the second recurrent vein joining the second submarginal cell before the latter's midlength (rather than being interstitial with the second intersubmarginal vein), all body setae appressed (genal setae erect in *P. amabile*), the frontal and clypeal setae silvery (rather than conspicuously golden), the wing membrane hyaline (rather than yellow basally, dark brown apically), and the body length is 5.2 mm rather than 11.0-11.5 mm in the female and 8.0-8.5 mm in the male. In the female, the middle clypeal lobe is nonprominent in *P. melanocephalum*, but prominent in *P. amabile*. The unusually small second submarginal cell of *P. melanocephalum* is a subsidiary recognition feature (height about one third of that of third submarginal cell), although the males of *P. amabile* approach this condition. The male of *P. melanocephalum* is unknown.

**DESCRIPTION.**— Head globose in dorsal view (Fig. 641). Frons swollen, dull, minutely, shallowly punctate, punctures less than one diameter apart (about one diameter apart near midocellus). Antennal socket nearly touching eye margin. Labrum emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Scutum not foveate along flange, with minute, short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart; interspaces dull. Tegula minutely punctate throughout. Mesopleural punctures minute, several diameters apart. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum: longitudinal carina separating side from dorsum present only behind spiracle; dorsum punctate, unridged, with irregular middle carina basally; side and posterior surface punctate, without ridges. Second submarginal cell minute, about one third height of third submarginal; first recurrent vein ending well before submarginal cell II; second recurrent vein ending on basal half of submarginal cell II (Fig. 642). Hindcoxal dorsum with outer margin carinate only basally. Tergum I sloping gently toward base, markedly less so than in most other *Pison*, its punctures minute, on horizontal part more than one diameter apart. Sterna punctate throughout.



FIGURES 640-643. *Pison melanocephalum* Turner, female. (640) Clypeus and mandibles; (641) Head in dorsal view; (642) Apical part of forewing; (643) Body of lectotype in lateral view.

FIGURE 644. Collecting localities of *Pison melanocephalum* Turner

Setae silvery, appressed on entire body, inconspicuous on frons.

Head black, female clypeus ferruginous next to lobe free margin, mandible yellowish, brown apically, antenna ferruginous; thorax, propodeum, legs, and gaster ferruginous, sternum II in lectotype largely black.

♀ (Fig. 643).— Upper interocular distance equal to  $1.3-1.5 \times$  lower interocular distance; ocellular distance equal to  $0.45-0.50 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.04-1.05 \times$  distance between eye notches. Middle clypeal lobe nonprominent, free margin inconspicuously concave on each side of lobe (Fig. 640). Dorsal length of flagellomere I  $2.2-2.3 \times$  apical width, of flagellomere IX  $1.2-1.4 \times$  apical width. Mandible: trimmal carina with minimal incision at about midlength. Length 5.2-5.6 mm; head width 1.3-1.4 mm.

♂.— Unknown.

GEOGRAPHIC DISTRIBUTION (Fig. 644).— Known from two adjacent localities in Queensland.



RECORDS.— AUSTRALIA: Queensland: Cairns (1 ♀, BMNH, lectotype of *Pison melanocephalum*), Kuranda (1 ♀, BMNH).

***Pison minutum* Pulawski, species nova**

Figures 645-649.

NAME DERIVATION.— *Minutus* (neuter: *minutum*), a Latin adjective meaning *minute*; with reference to this species body size.

RECOGNITION.— Only the female of this species is known. It is small (length 3.8-4.0 mm), all black, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. It has a psammophore on the forefemoral venter and in some specimens also on the lower gena, but unlike other such species the psammophore is unusually short, its longest setae being equal to  $0.5-0.6 \times$  midocellar diameter; the lower gena is impunctate and asetose on each side of the oral fossa. The scutum conspicuously microsculptured between punctures, the absence of the median sulcus on the propodeal dorsum, the absence of the longitudinal carina separating the propodeal side from the dorsum and posterior surface, and the sterna punctate throughout are subsidiary recognition features.

DESCRIPTION.— Frons dull, minutely punctate, punctures less than one diameter apart, middle supraantennal carina absent. Gena narrow in dorsal view (Fig. 646). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about two thirds of the midocellar diameter. Propleuron impunctate anteriorly, conspicuously microsculptured. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart (Fig. 648); interspaces dull, markedly microsculptured. Tegula not enlarged. Mesopleural punctures minute, less than one diameter apart, partly concealed by appressed setae. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, longitudinally ridged, punctate between ridges, without middle sulcus; side ridged, punctate between ridges, ridges oriented longitudinally except anterior ridges oriented anteroventrally; posterior surface irregularly transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I minute, about one diameter apart anterior to apical depression. Sterna finely, closely punctate throughout.

Setae silvery, appressed on upper frons, postocellar area, scutum, and tergum I, oriented ventrally on upper frons; not concealing integument on clypeus; genal setae: see below. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible (except basally) and tarsi dark brown.

♀.— Upper interocular distance equal to  $0.60 \times$  lower interocular distance; ocellocular distance equal to  $0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $0.88 \times$  distance between eye notches. Free margin of clypeal lamella arcuate, with ill-defined lateral corner (Fig. 645). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Lower gena impunctate and asetose on each side of oral fossa. Mandibular posterior margin and forefemoral venter with psammophore, psammophore absent on lower gena in paratype (Fig. 647), in holotype present on right side and absent on left side (psammophore short, its longest setae about  $0.5-0.6 \times$  midocellar diameter). Mandible: trimmal carina with minute incision at about two thirds of length. Tergum VI somewhat broadened. Length 3.8-4.0 mm; head width 1.3 mm.

♂.— Unknown.



FIGURES 645-648. *Pison minutum* Pulawski, sp. nov., female. (645) Clypeus and mandibles; (646) Head in dorsal view; (647) Left gena in lateral view; (648) Tegula and adjacent scutum.

FIGURE 649. Collecting locality of *Pison minutum* Pulawski, sp. nov.



**GEOGRAPHIC DISTRIBUTION** (Fig. 649).—Known from one locality in northern part of Northern Territory.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Northern Territory: Jabiru, 5-9 June 1984. I.D. Naumann (ANIC).

PARATYPE: same data as holotype (1 ♀, CAS).

***Pison modestum* Pulawski, species nova**

Figures 650-657.

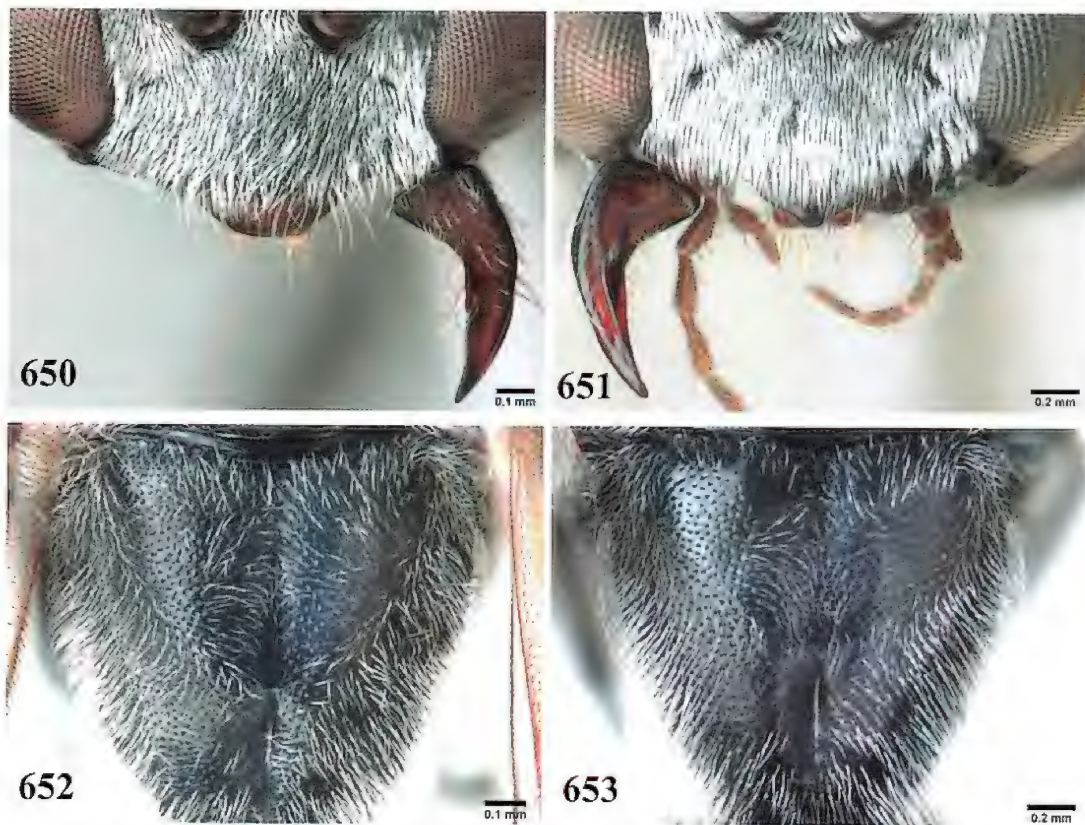
**NAME DERIVATION.**—*Modestus* (neuter: *modestum*) is the Latin adjective meaning *modest*; with reference to this species small size and lack on conspicuous diagnostic features.

**RECOGNITION.**—*Pison modestum* is an all black, small species (length 6.2-6.8 mm in female, 5.4-6.3 mm in male), with three submarginal cells, the second recurrent vein interstitial with second intersubmarginal vein, and setae appressed on the frons, postocellar area, scutum, and tergum I, on the lower gena curved, slightly shorter than the midocellar diameter. It is further

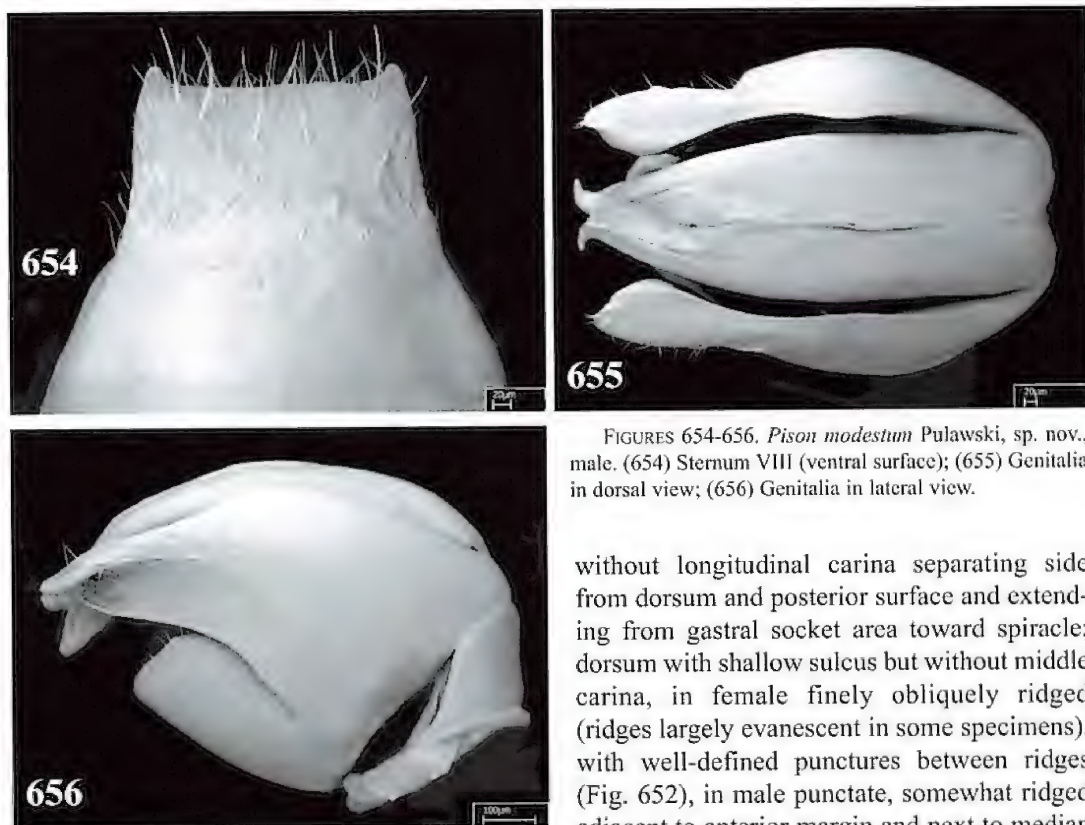


characterized by the narrow ocellocular distance (equal to about  $0.4 \times$  postocellar diameter), the absence of the carina separating the propodeal side from the dorsal and posterior surfaces, and in the male the free margin of the clypeal lamella obtusely angulate to narrowly arcuate (Fig. 651). *Pison angustivertex* and *P. brachyceras* are similar, but they differ in having the propodeal dorsum markedly ridged, with the punctures inconspicuous, and the entire posterior propodeal surface ridged (at least mesally). In *P. modestum*, the posterior propodeal surface is punctate in the dorsal half or so; the propodeal dorsum, in the female, is finely, obliquely ridged, the ridges not concealing the punctures, and in the male punctate, somewhat ridged adjacent to the anterior margin and next to the median sulcus (at least some punctures are more than one diameter apart except less than one diameter apart laterally).

**DESCRIPTION.**—Frons slightly swollen above antennal socket, minutely punctate, punctures ill defined, about one diameter apart, interspaces conspicuously microsculptured; middle supraantennal carina present, but short, about as long as  $0.5 \times$  midocellar diameter. Gena narrow in dorsal view. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, about one diameter apart; interspaces markedly microsculptured. Tegula not enlarged. Mesopleural punctures fine, slightly more than one diameter apart; interspaces unsculptured. Postspiracular carina present,  $1.0\text{--}1.5 \times$  as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum



FIGURES 650-653. *Pison modestum* Pulawski, sp. nov. (650) Female clypeus and mandible; (651) Male clypeus and mandible; (652) Female propodeum in dorsal view; (653) Male propodeum in dorsal view.



FIGURES 654-656. *Pison modestum* Pulawski, sp. nov., male. (654) Sternum VIII (ventral surface); (655) Genitalia in dorsal view; (656) Genitalia in lateral view.

without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with shallow sulcus but without middle carina, in female finely obliquely ridged (ridges largely evanescent in some specimens), with well-defined punctures between ridges (Fig. 652), in male punctate, somewhat ridged adjacent to anterior margin and next to median

sulcus (Fig. 653), at least some punctures more than one diameter apart except laterally; side punctate (punctures averaging more than one diameter apart), interspaces in some specimens merging into minute ridges; posterior surface punctate, transversely ridged in ventral third or quarter. Posteroventral forefemoral surface microscopically, closely punctate. Hindcoxa dorsum with outer margin sharply carinate near apex. Punctures of tergum I minute, averaging a few diameters apart on horizontal portion (anterior to apical depression). Sterna punctate throughout, punctures of sternum II averaging about 2-3 diameters apart mesally.

Setae silvery, appressed on frons, postocellar area, scutum, and tergum I, oriented obliquely ventrad on upper frons, on lower gena subappressed to suberect, curved, slightly shorter than midocellar diameter; completely concealing integument on clypeus (except lamella). Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible dark reddish mesally in many specimens.

♀.— Upper interocular distance equal to  $0.48-0.56 \times$  lower interocular distance; ocellocular distance equal to  $0.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 650). Dorsal length of flagellomere I  $2.4-2.6 \times$  apical width, of flagellomere IX  $1.2-1.3 \times$  apical width. Mandible: trimmal carina with minute incision shortly beyond midlength. Length 6.2-6.8 mm; head width 1.8-1.9 mm.

♂.— Upper interocular distance equal to  $0.56-0.58 \times$  lower interocular distance; ocellocular distance equal to  $0.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.08-1.12 \times$  distance between eye notches. Free margin of clypeal



lamella obtusely angulate to narrowly arcuate (Fig. 651). Dorsal length of flagellomere I  $2.3\text{--}2.5 \times$  apical width, of flagellomere X  $1.0\text{--}1.1 \times$  apical width. Apical margin of sternum VIII broadly emarginate (Fig. 654). Genitalia: Figs. 655, 656. Length 5.4–6.3 mm; head width 1.6–1.7 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 65).—Australian Capital Territory, Northern Queensland.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA: Queensland:** 13 km SE Weipa at  $12^{\circ}40'S$   $143^{\circ}00'E$ , 12 Sept – 24 Oct 1993, P. Zborowski and D. Rentz (ANIC).

**PARATYPES:** **AUSTRALIA: Australian Capital Territory:** Black Mountain: [no day] Jan 1982, J.R.T. Short and C. Tiedemann (1 ♂, ANIC) and [no day] Jan 1982, I.D. Naumann and J.C. Cardale (1 ♂, ANIC). **Queensland:** 11 km NW Bald Hill in Mellwraight Range at  $13^{\circ}44'S$   $143^{\circ}20'E$ , 26 June – 13 July 1989, I.D. Naumann (1 ♂, CAS); 12 km SSE Heathlands at  $11^{\circ}51'S$   $142^{\circ}38'E$ , P. Feehney, 26 Jan – 1 Mar 1992 (1 ♀, ANIC), 1–21 Mar 1992 (1 ♀, CAS), and 2–22 Mar 1992 (1 ♀, ANIC); same locality, 22 Mar – 25 Apr 1992, T. McLeod (1 ♀, ANIC); same locality, 15–26 Jan 1992, T.A. Weir and I.D. Naumann (1 ♂, CAS); same locality, 21 Aug – 17 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC; 1 ♀, CAS); 14 km ENE Heathlands at  $11^{\circ}41'S$   $142^{\circ}42'E$ , 21 Jan – 19 Feb 1994, P. Zborowski (2 ♀, CAS); 15 km ENE Heathlands at  $11^{\circ}41'S$   $142^{\circ}42'E$ , 15–26 Jan 1992, I.D. Naumann and T.A. Weir (1 ♀, 2 ♂, ANIC); 3 km ENE Mount Tozeur at  $12^{\circ}44'S$   $143^{\circ}14'E$ , 28 June – 4 July 1986, J.C. Cardale (1 ♀, CAS).



FIGURE 657. Collecting localities of *Pison modestum* Pulawski, sp. nov.

### *Pison morosum* F. Smith

Figures 658–666.

*Pison morosum* F. Smith, 1856:317, ♀ (as *morosus*, incorrect original termination, referring to White and Butler MS). Holotype or syntypes: ♀, New Zealand: no specific locality (BMNH). — F. Smith, 1869:291 (in checklist of *Pison*); Hutton, 1881:103 (in catalog of New Zealand Hymenoptera); W.F. Kirby, 1881:40 (in checklist of New Zealand Hymenoptera), 1884:69 (in checklist of New Zealand Hymenoptera); Kohl, 1885:187 (in checklist of world *Pison*); Cameron, 1898:46 (New Zealand: Greymouth); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Hutton, 1898:158 (Chatham Island, as *morosus*); Cameron, 1901:220 (known from New Zealand); Hutton, 1904:98 (in list of New Zealand fauna); Turner, 1916b:627 (diagnostic characters); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Callan, 1979:36 (New Zealand; available information reviewed); Laing, 1988:37 (prey, hunting); MacFarlane and Palma, 1988:423 (nest parasite: *Melittobia australica* Girault, a eulophid); Valentine and Walker, 1991:40 (in catalog of New Zealand Hymenoptera); Harris, 1994:31 (in Fauna of New Zealand, nesting habits).

*Pison tuberculatum* F. Smith, 1869:296, ♂ (as *tuberculatus*, incorrect original termination). Holotype or syntypes: ♂, New Zealand: no specific locality (BMNH). Synonymized with *Pison morosum* by Harris, 1994:31. — W.F. Kirby, 1881a:40 (in checklist of New Zealand Hymenoptera), 1884:69 (in checklist of New Zealand Hymenoptera); Kohl, 1885:188 (in checklist of world *Pison*); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Hutton, 1904:98 (in list of New Zealand fauna); Alfken, 1904a:620 (New Zealand: Chatham Island); R. Turner, 1916b:626 (diagnostic characters); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Callan, 1979:36 (New Zealand); Valentine and Walker, 1991:40 (in catalog of New Zealand Hymenoptera).

**RECOGNITION.**—*Pison morosum*, an endemic of New Zealand, closely resembles *P. westwoodi*. Like that species, it has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, the setae appressed on tergum I, the propodeum

with a longitudinal carina separating the dorsum and posterior surface from the side and extending from the gastral socket area toward the spiracle, and the propodeal dorsum is finely ridged (not ridged apically in many specimens). In the female, the ocellocular distance equals  $0.3 \times$  hindocellar diameter and the mesopleural punctures are several diameter apart at the center. In the male, sterna II-IV have each a preapical transverse swelling that is broadly interrupted mesally (swelling on sternum II is the smallest, that on sternum III the largest).

The two species differ as follows: in *P. morosum*, the setae of upper frons are brown and up to  $0.7 \times$  as long as the midocellar diameter just below the midocellus, the apical portion of sternum II is impunctate, and in the male sternum II has an ill-defined, preapical, medially divided transverse swelling. In *P. westwoodii*, the setae of the upper frons are silvery,  $0.3$ - $0.4 \times$  as long as the midocellar diameter just below the midocellus, the apical portion of sternum II is microscopically punctate, and male sternum II is simple.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures averaging 2-3 diameters apart; interspaces microareolate (Fig. 660). Gena narrow in dorsal view (Fig. 661). Labrum shallowly emarginate mesally. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures minute, averaging 2-3 diameters apart on disk (Fig. 662). Tegula not enlarged. Mesopleural punctures fine, averaging several diameters apart at center; interspaces aciculate. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, obliquely ridged (ridges disappearing before dorsum's apex in several specimens), punctate between ridges; side finely, irregularly ridged, punctate between ridges (ridges evanescent in several specimens); posterior surface transversely ridged (finely rugose dorsally in some specimens), irregularly sculptured and microscopically punctate between ridges. Posteroventral forefemoral surface minutely punctate, punctures averaging 2-3 diameters apart. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I minute, averaging several diameters apart in middle of horizontal part. Sternum II with minute punctures that are several to many diameters apart mesally, impunctate apicomesally.

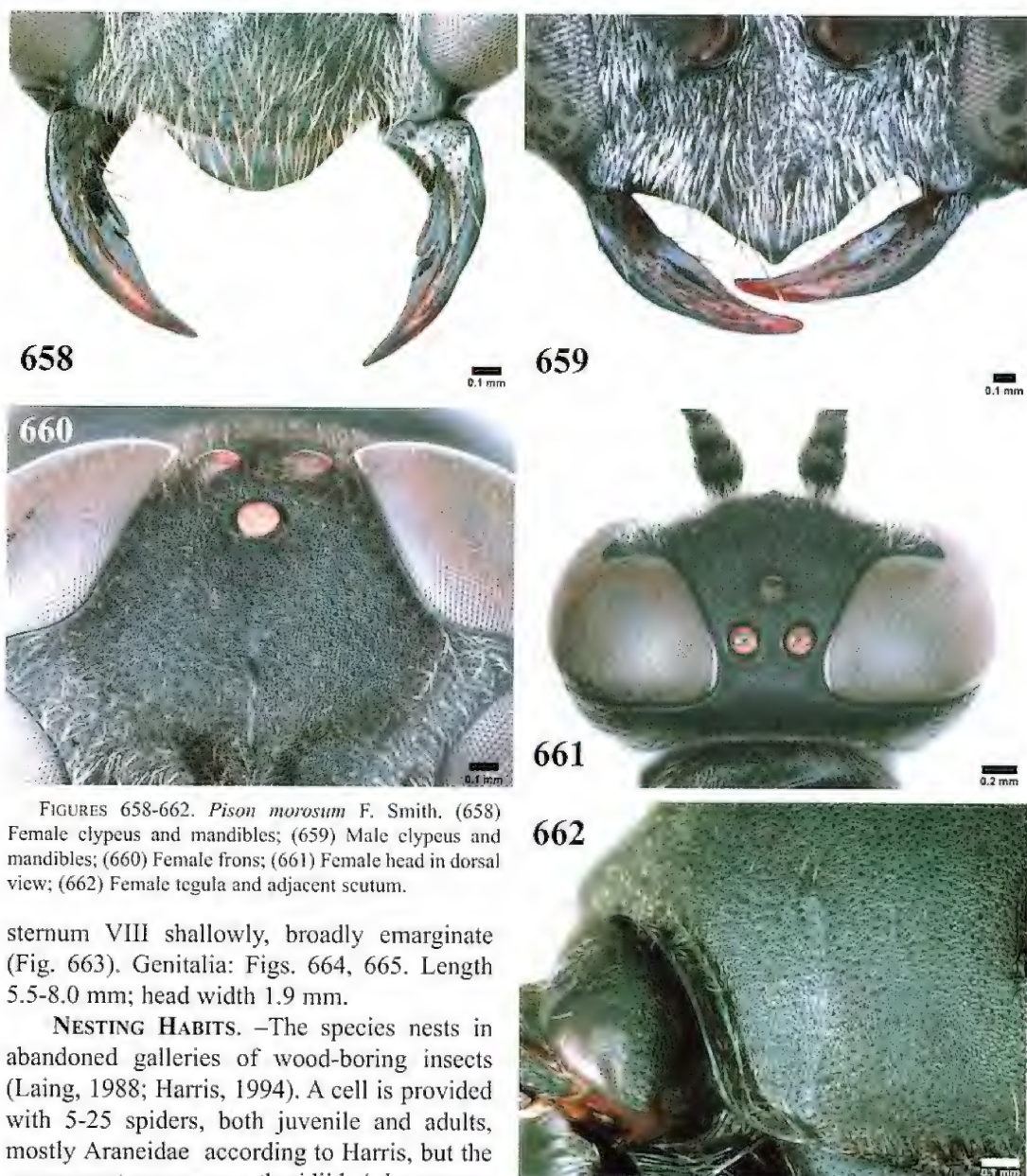
Setae silvery except brown on upper frons, erect or bent ventrally on upper frons and up to  $0.7 \times$  as long as midocellar diameter, erect on postocellar area but markedly shorter than midocellar diameter, appressed on scutum and tergum I, on lower gena erect, straight, up to about  $0.7 \times$  as long as midocellar diameter; not concealing integument on clypeus. Apical depressions of terga without setal fasciae in female, with evanescent silvery fasciae in male.

Body all black, mandibular apex brown.

♀.—Upper interocular distance equal to  $0.54 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.02 \times$  distance between eye notches. Free margin of clypeal lamella rounded (Fig. 658). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere IX  $1.5 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 7.5-11.5 mm; head width 2.4-2.5 mm.

♂.—Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella obtusely pointed, very apex may be sharply pointed (Fig. 659). Dorsal length of flagellomere I  $2.3 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Sterna II-IV with preapical transverse swellings that are broadly interrupted mesally (swelling on sternum II smallest, that on sternum III largest);





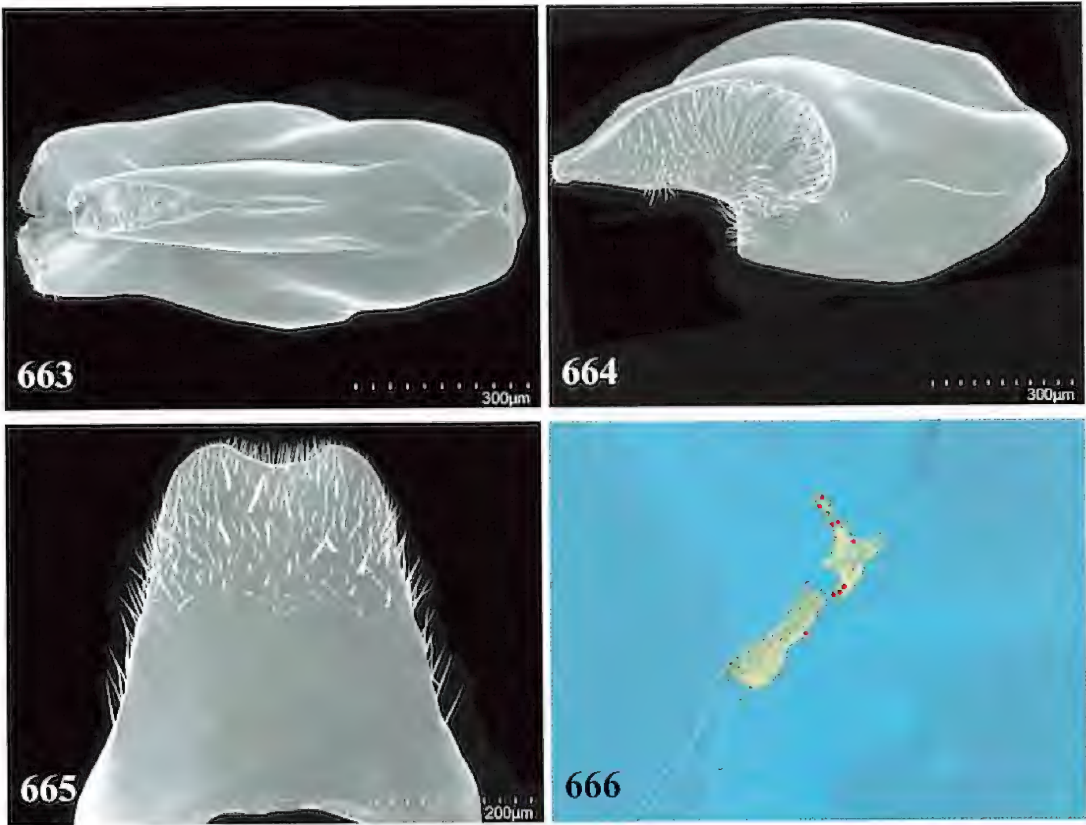
FIGURES 658-662. *Pison morosum* F. Smith. (658) Female clypeus and mandibles; (659) Male clypeus and mandibles; (660) Female frons; (661) Female head in dorsal view; (662) Female tegula and adjacent scutum.

sternum VIII shallowly, broadly emarginate (Fig. 663). Genitalia: Figs. 664, 665. Length 5.5-8.0 mm; head width 1.9 mm.

**NESTING HABITS.**—The species nests in abandoned galleries of wood-boring insects (Laing, 1988; Harris, 1994). A cell is provided with 5-25 spiders, both juvenile and adults, mostly Araneidae according to Harris, but the commonest prey was a theridiid *Achaearenea veruculata* Urquhart, now *Cryptachaea veruculata* (Urquhart), according to Laing. The species is bivoltine, with a facultative winter prepupal diapause.

**GEOGRAPHIC DISTRIBUTION** (Fig. 666).—New Zealand, common on both Northern and Southern islands (Harris, 1994).

**RECORDS.**—**NEW ZEALAND:** **Northern Island:** Hamurana Springs NE of Lake Rotorua (1 ♀, CAS), Kerikeri (1 ♂, CAS), Maropiu (2 ♀, 2 ♂, CAS), Titiragi (1 ♀, RMNH), Waiheke Island: Rocky Bay (3 ♀, RMNH), Wairarapa at 40.80°S 175.55°E (1 ♀, CAS; 1 ♀, RMNH) and 41.16°S 175.23°E (2 ♀, RMNH), Wellington (Laing, 1988). **Southern Island:** Christchurch: between Thornington Road and Heathcote River (1 ♀, RMNH).



FIGURES 663-665. *Pison morosum* F. Smith, male. (663) Sternum VIII (ventral surface); (664) Genitalia in dorsal view; (665) Genitalia in lateral view.

FIGURE 666. Collecting localities of *Pison morosum* F. Smith.

***Pison naralte* Pulawski, species nova**

Figures 667-674.

**NAME DERIVATION.**—*Naralte* was an Australian aboriginal tribe that lived in the Renmark area, South Australia, where the holotype was collected; a noun in apposition to the generic name.

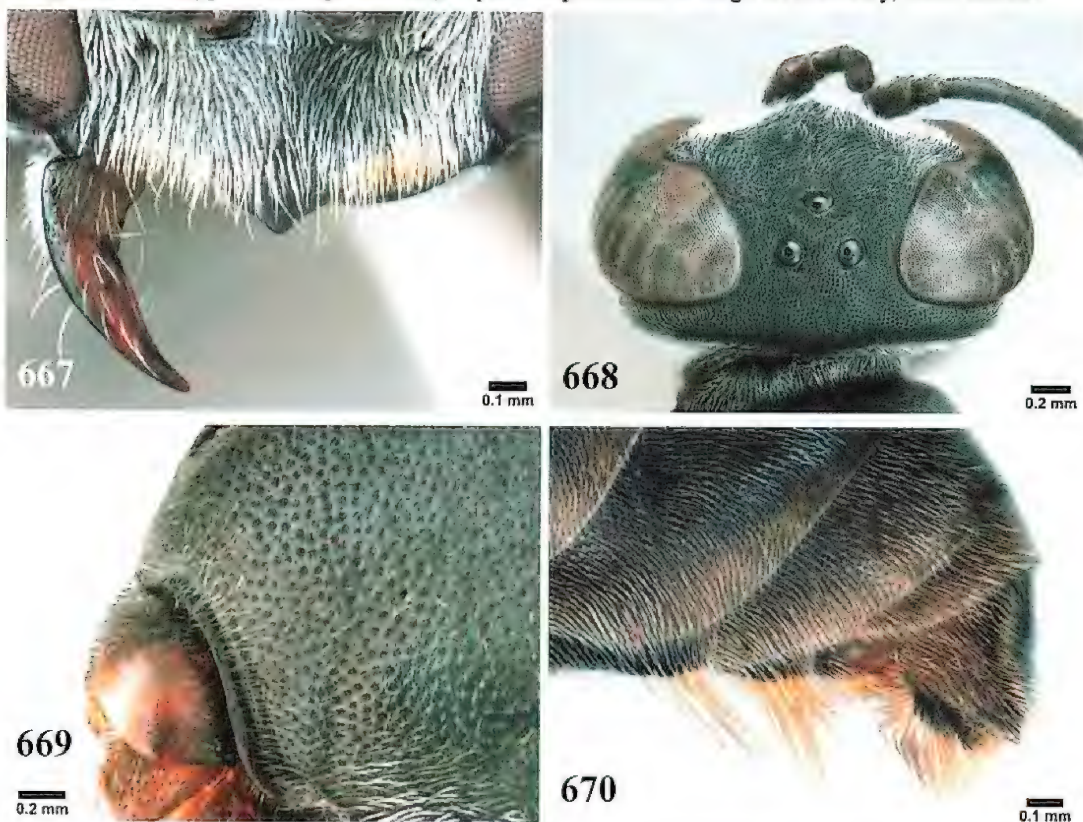
**RECOGNITION.**—*Pison naralte* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. The female is unknown. The male is characterized by a non-emarginate sternum VIII combined with the presence of a tuft of erect setae on the apicolateral parts of sterna IV and V (Fig. 670). *Pison penicillatum* is similar, although the erect setae are present on the apicolateral corner of sternum VII. Otherwise the two species differ as follows: in *P. naralte* the setae of the upper frons are about  $0.5 \times$  midocellar diameter long (about  $1.0 \times$  midocellar diameter in *P. penicillatum*), those on the scutum are appressed (most *P. penicillatum* have sparse, erect setae whose length is at least one midocellar diameter), and those on the lower gena are shorter than the midocellar diameter (rather than  $1.5\text{--}2.0 \times$  as long as the midocellar diameter). Also, sternum II is closely punctate at least anterior of the apical depression (in *P. penicillatum*, sternum II is impunctate along the midline or has a few sparse punctures except closely punctate basally), sternum VIII has no longitudinal swelling (with obtuse, longitudinal swelling in *P. penicillatum*), and erect setae



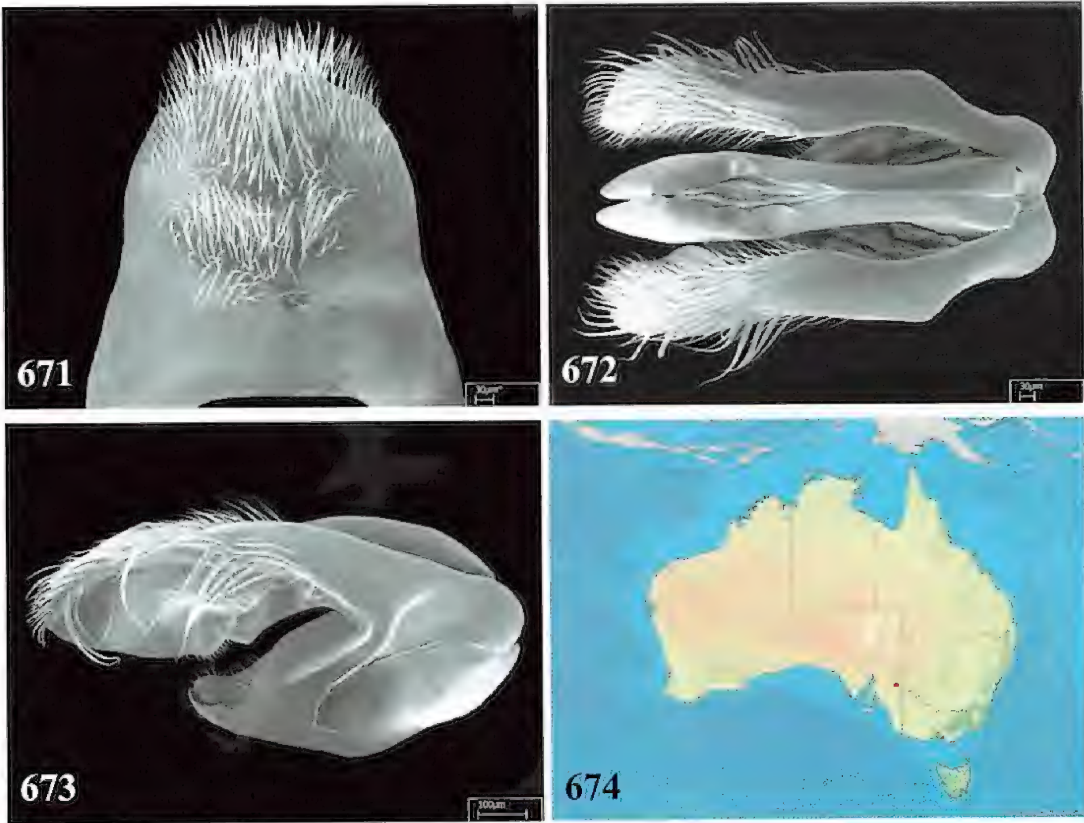
of sternum V are  $1.8-2.0 \times$  as long as midocellar diameter (rather than as long as midocellar diameter on sternum VII).

**DESCRIPTION.**—Frons dull, finely, shallowly punctate, punctures less than one diameter apart. Labrum not emarginate. Gena narrow in dorsal view (Fig. 668). Anteromedian pronotal pit transversely elongate, about  $2.5 \times$  as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, most punctures on disk averaging 2-3 diameter apart (Fig. 669). Tegula enlarged. Mesopleural punctures compressed against each other or nearly so. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged in anterior half, transversely ridged in posterior half, punctate between ridges; side ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I, anterior of apical depression, averaging slightly more than one diameter apart. Punctures of sternum II in holotype less than one diameter apart basally, up to two diameters apart on each side preapically and sublaterally, apical depression impunctate, in paratype closely punctate throughout.

Setae silvery, nearly appressed on upper frons, appressed on postocellar area, scutum, and tergum I; on lower gena suberect, straight, shorter than midocellar diameter; largely concealing integument on clypeus (except lamella). Apical depressions of terga with silvery, setal fasciae.



FIGURES 667-670. *Pison naralte* Pulawski, sp. nov., male. (667) Clypeus and mandible; (668) Head in dorsal view; (669) Tegula and adjacent scutum; (670) Gastral apex in lateral view.



FIGURES 671-673. *Pison naralte* Pulawski, sp. nov., male. (671) Sternum VIII (ventral surface); (672) Genitalia in dorsal view; (673) Genitalia in lateral view.

FIGURE 674. Collecting locality of *Pison naralte* Pulawski, sp. nov.

Body all black, mandible brown mesally.

♀.— Unknown

♂.— Upper interocular distance equal to  $0.80-0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.3 \times$  hindocellar diameter; eye height equal to  $1.02 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 667). Dorsal length of flagellomere I  $2.2 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Sternum V with well-defined median sulcus on apical depression; apicolateral parts of sterna IV and V with tufts of erect setae (Fig. 670), setae of sternum V  $1.8-2.0 \times$  as long as midocellar diameter. Apical margin of sternum VIII rounded (Fig. 671). Genitalia: Figs. 672, 673. Length 7.6-7.8 mm; head width 2.3-2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 674).— Known from a single locality in southeastern South Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: South Australia: 79 km NNW Renmark at  $33^{\circ}31'S$   $140^{\circ}24'E$ , 8 Nov – 12 Dec 1995, K.R. Pullen (ANIC).

PARATYPES: AUSTRALIA: South Australia: same data as holotype (1 ♂, CAS); same data as holotype except 12 Dec 1995 – 25 Jan 1996 (1 ♂, ANIC).



***Pison nigricans* Pulawski, species nova**

Figures 675-680.

**NAME DERIVATION.**— *Nigricans* is a Latin present active participle of the verb *nigricare*, to become black, dark; with reference to this species body color.

**RECOGNITION.**— Only the male of this species is known. It is small (length 4.7-4.8 mm), all black, with the setae appressed on the upper frons, postocellar area, scutum, and tergum I, on the lower gena suberect, straight, about  $0.5 \times$  as long as the midocellar diameter. The second recurrent vein varies: it is either interstitial with the second intersubmarginal vein or ends at about three quarters the length of the second submarginal cell. The clypeal lamella is acutely angulate, the dorsal length of flagellomere I is  $1.8 \times$  the apical width, the propodeum has a carina separating the side from the dorsum and the posterior surface, the propodeal dorsum is rugose, the sterna are uniformly, densely punctate throughout, and sternum VIII is shallowly, broadly emarginate apically. The apical portion of tergum VII is unspecialized: not emarginate apically, without median carina, and black (not yellow). Several species are similar, but *P. nigricans* differs as follows: ocellocular distance  $0.8 \times$  hindocellar diameter, scutal and mesopleural punctures well defined (most scutal punctures averaging one diameter apart or more, mesopleural punctures up to about one diameter apart at the center), occipital carina not expanded.

**DESCRIPTION.**— Frons dull, punctures well defined, less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 676). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly shorter than midocellar diameter. Propleuron largely impunctate. Scutum finely foveate along flange, with a few short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, most punctures averaging at least one diameter apart. Tegula not enlarged, punctate over most of its surface (impunctate posterolaterally). Mesopleural punctures well defined, about one diameter apart near center. Postspiracular carina present, slightly longer than midocellar diameter. Metapleural sulcus slightly costulate or not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly obliquely ridged (holotype) or rugose (paratype); side ridged, punctate between ridges; posterior surface ridged. Second recurrent vein interstitial with second intersubmarginal vein in paratype, but ending at about three quarters the length of second submarginal cell in holotype. Posteroventral forefemoral surface with minute punctures that average slightly more than one diameter apart. Punctures of tergum I anterior of apical depression averaging about one diameter apart. Sterna densely punctate throughout.

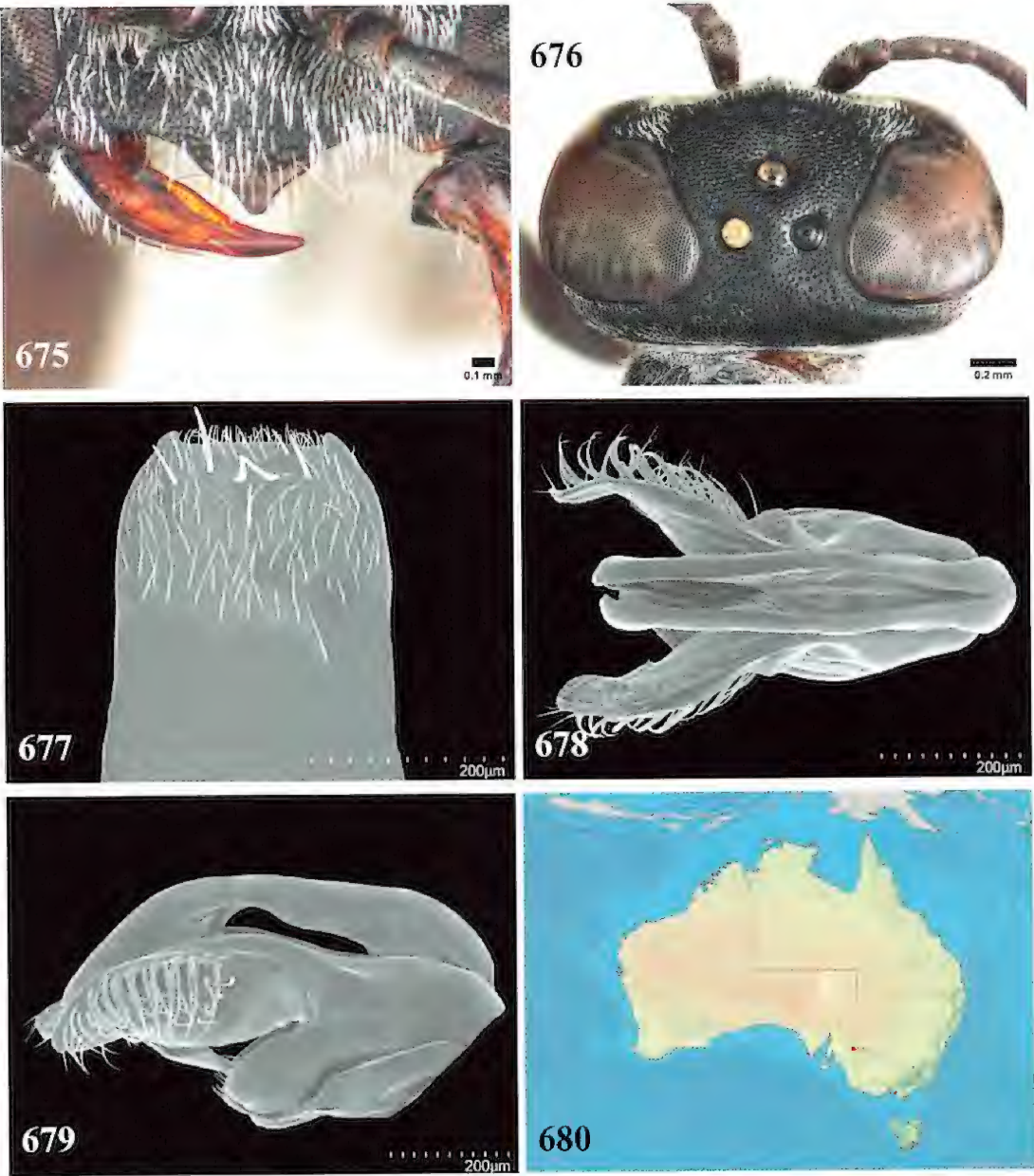
Setae silvery, appressed on upper frons, postocellar area, scutum, and tergum I; largely concealing integument on clypeus; setae of lower gena suberect, straight, about  $0.5 \times$  as long as midocellar diameter. Apical depressions of terga with ill-defined, silvery setal fasciae.

Body black, mandible dark ferruginous near midlength; apical tarsomeres brown; hindtibial spurs dark brown.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 675). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Sternum VIII shallowly, broadly emarginate (Fig. 677). Genitalia: Figs. 678, 679. Length 4.7-4.8 mm; head width 1.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 680).— Known from one locality in southeastern South Australia.



FIGURES 675-679. *Pison nigricans* Pulawski, sp. nov., male. (675) Clypeus and mandible; (676) Head in dorsal view; (677) Sternum VIII (ventral surface); (678) Genitalia in dorsal view; (679) Genitalia in lateral view.  
FIGURE 680. Collecting locality of *Pison nigricans* Pulawski, sp. nov.



RECORDS.—HOLOTYPE: ♂, AUSTRALIA: **South Australia**: 14 km WNW Renmark at 34°07'S 140°37'E, 13 Dec 1995 – 25 Jan 1996, K.R. Pullen (ANIC).

PARATYPE: AUSTRALIA: **South Australia**: same data as holotype (1 ♂, CAS).

*Pison nitens* Pulawski, species nova

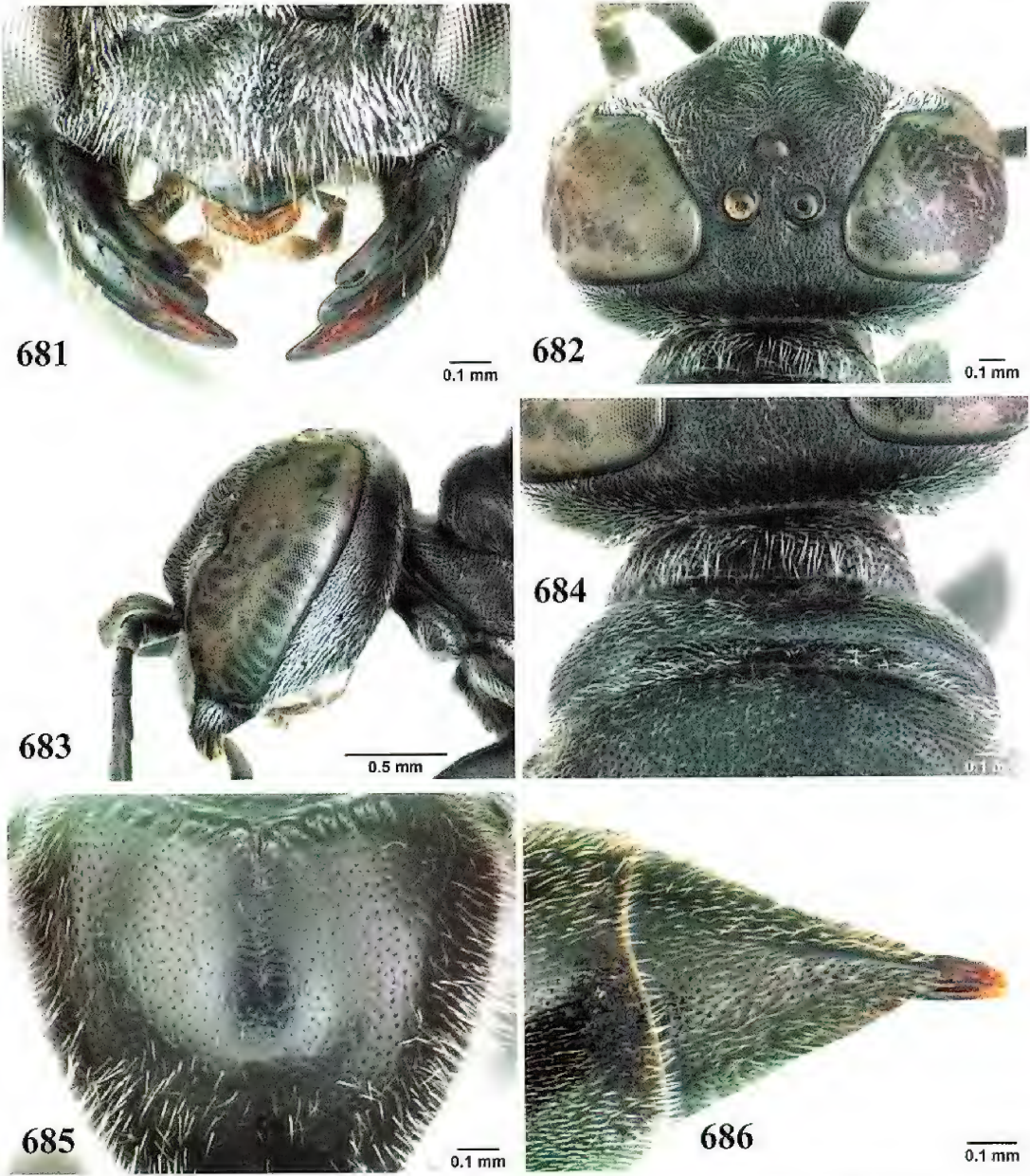
Figures 681-691.

NAME DERIVATION.—*Nitens*, Latin present active participle of the verb *nitere*, to shine; with reference to its shiny propodeal dorsum.

RECOGNITION.—*Pison nitens* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. Like *P. infumatum* and *P. laeve*, it has the propodeal dorsum sparsely punctate (punctures several diameters apart), both admedially and laterally, and the interspaces unridged and unsculptured (Fig. 685). It differs from these two species in having the hindfemur thickened dorsoapically (Fig. 687), more so in male than in female. Unlike *P. laeve*, the scutal flange of *P. nitens* is the usual shape (rather than conspicuously expanded). Unlike *P. infumatum*, the frons of *P. nitens* has a well-defined protuberance above the antennal socket (Figs. 682, 683), the pronotal collar is swollen (Fig. 684), the punctures of the scutum, mesopleuron, and tergum I are well defined, the clypeal lip of the female has a small median projection and the mandibular inner margin has two preapical teeth separated by an incision (Fig. 681). In *P. infumatum*, the frons has an ill-defined protuberance above the antennal socket, the pronotal collar is not swollen, the punctures of the scutum, mesopleuron, and tergum I are minute, ill defined, and in the female the clypeal lip is evenly, prominently arcuate and the mandible is unidentate apically.

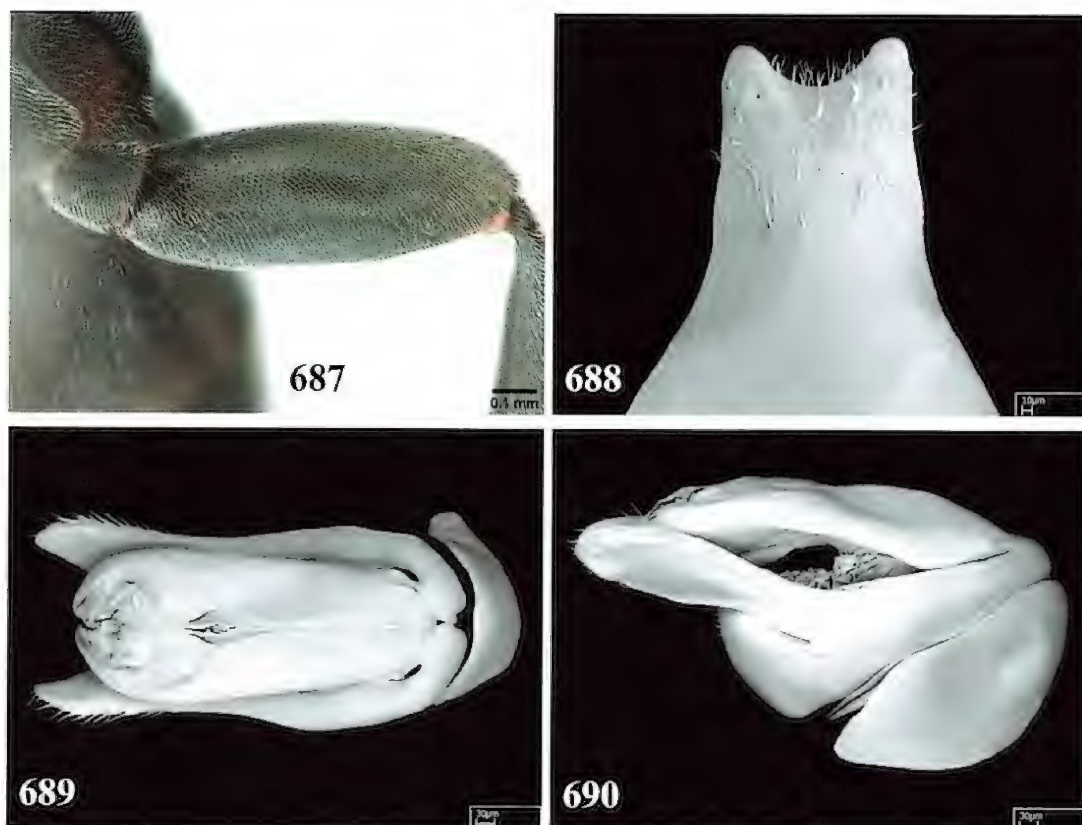
DESCRIPTION.—Head subspherical in dorsal view (Fig. 682). Frons swollen above antennal socket (Fig. 683), dull, with fine but well-defined punctures that are about one diameter apart. Labrum not emarginate. Anteromedian pronotal pit not elongate, slightly wider than midocellar diameter. Pronotal collar swollen in most specimens (Fig. 685), not swollen in males from Lansdowne area, New South Wales. Propleuron sparsely punctate anteromesally. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging more than one diameter apart on disk; interspaces slightly microsculptured. Tegula not enlarged. Mesopleural punctures well defined, averaging about one diameter apart near center; interspaces unsculptured. Postspiracular carina present, about half as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with evanescent middle carina in about half or third of length, in most specimens with short, evanescent, transverse carinae emerging from midline; most of surface minutely punctate (punctures several diameters apart), interspaces unsculptured, shiny, unridged (Fig. 685); side punctate (punctures more than one diameter apart, interspaces unsculptured), impunctate anteriorly except finely ridged anterodorsally; posterior surface punctate (punctures several to many diameters apart, interspaces unsculptured, shiny), in most specimens transversely ridged ventrally. Posteroventral forefemoral surface with minute but well defined punctures, averaging 2-3 diameters apart. Hindcoxa dorsum with outer margin sharply carinate in apical half. Hindfemur thickened dorsoapically (Fig. 687), more so in male than in female. Punctures of tergum I well defined, averaging 2-3 diameters apart at center of horizontal part. Sternum II punctate throughout, punctures fine but well defined, averaging 2-3 diameters apart on disk.

Setae silvery, appressed on frons, lower gena, scutum, and tergum I; inconspicuous, oriented dorsad on upper frons (between dorsal end of middle carina and midocellus); not concealing integument on clypeus. Apical depressions of terga with inconspicuous setal fasciae.



FIGURES 681-686. *Pison nitens* Pulawski, sp. nov., female. (681) Clypeus and mandibles; (682) Head in dorsal view; (683) Head in lateral view; (684) Pronotal collar in dorsal view; (685) Propodeal dorsum; (686) Tergum VI in oblique lateral view.





FIGURES 687-690. *Pison nitens* Pulawski, sp. nov. (687) Female hindfemur; male: (688) Sternum VIII (ventral surface); (689) Genitalia in dorsal view; (690) Genitalia in lateral view.

Body all black.

♀.— Upper interocular distance equal to  $0.62\text{--}0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.6\text{--}0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $0.98\text{--}1.06 \times$  distance between eye notches. Free margin of clypeal lamella widely rounded (Fig. 681), in most specimens with small median point that extends as obtuse carina dorsally on lamella's surface. Dorsal length of flagellomere I  $2.0\text{--}2.3 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: inner margin with two preapical teeth separated by incision (Fig. 681). Tergum VI with median carina in apical third (Fig. 686). Length 6.8 mm; head width 1.8–2.1 mm.

♂.— Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate. Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Mandible with abductor carina in one male from Lansdowne area. Sternum VIII deeply emarginate apically (Fig. 688). Genitalia: Figs. 689, 690. Length 6.5–8.7 mm; head width 1.5–1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 691).— New South Wales, Northern Territory, Queensland, Western Australia.

**RECORDS.—** HOLOTYPE: ♀, AUSTRALIA: New South Wales: Lorient Wildlife Refuge 3 km N Lansdowne near Taree, 8-15 Feb 1987, G. Williams (AMS).

**PARATYPES:** AUSTRALIA: Australian Capital Territory: Black Mountain, Dec 1982, I.D. Naumann and J.C. Cardale (1 ♂, ANIC). New South Wales: Broulee at 35°51'S 150°10'E, 26 Dec 1995, M.S. Upton (1 ♀, ANIC); Kamay Botany National Park 14 km S center of Sydney at 34°00.3'S 151°13.2'E, 3 Dec 2009, V. Ahrens and W.J. Pulawski (2 ♀, CAS); 0.5 km SE Lansdowne near Taree, 10-17 Jan 1993, G.A. Williams (2 ♂, AMS); Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E, 7 and 8 Jan 2012, V. Ahrens and W.J. Pulawski (2 ♀, CAS). Northern Territory: Berry Springs Park 50 km SE Darwin, 4-27 Dec 1993, S. and J. Peck (2 ♂, NTM); Kakadu National Park, 11-25 Dec 1993, S. and J. Peck (1 ♂, NTM). Queensland: Brisbane: Blunder Creek, 9 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♂, QMB); Brisbane Forest Park at 27°25'S 152°50'E, M.E. Irwin 7-27 Dec 1995 (1 ♀, MNKB) and 4 Jan – 2 Feb 1996 (1 ♀, MNKB); Brookfield, Jan 1983, Z. Bouček (1 ♂, AMS); Clermont, 28 Sept 1974, N. Clesovet (1 ♀, ANIC); Coast Range near Biggenden, 3 Oct 1976, H. Frauca (1 ♂, ANIC); Eungella National Park at 21°10.5'S 148°30.3'E, V. Ahrens and W.J. Pulawski, 31 Oct 2006 (1 ♀, CAS) and 2 Nov 2006 (2 ♀, CAS). Western Australia: 4 km W King Cascade at 15°38'S 125°15'E, 12-16 June 1988, T.A. Weir (1 ♀, ANIC).



FIGURE 691. Collecting localities of *Pison nitens* Pulawski, sp. nov.

### *Pison noctulum* Turner

Figures 692-700.

*Pison noctulum* Turner, 1908:516, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. – Turner, 1916b:596 (in key to Australian *Pison*), 600 (recognition characters, Australia: Queensland: Kuranda); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—Turner did not mention the number of the specimens examined in the original description of *Pison noctulum*. I have designated as the lectotype of this species the only specimen in The Natural History Museum, London.

**RECOGNITION.**—*Pison noctulum* is an all black species with two submarginal cells, a partly impunctate tegula, the propodeal dorsum and posterior surface separated from the side by a well-defined carina, and the scutellum foremargin with a foveate sulcus between the axillae (the sulcus is inconspicuous in some specimens). In the female, the clypeal free margin is not differentiated into the lobe and lateral sections, forming a single arcuate line from one orbit to the other (Fig. 692). In the male, there is no median lobe either, and the clypeal free margin forms an obtuse angle with a sharp median point (Fig. 693). *Pison clypeare* is similar, but differs in having the punctures of the upper frons about one diameter apart on average, the propodeal dorsum coarsely rugose posterolaterally, the posterior propodeal surface coarsely ridged throughout, the wing veins light brown to yellowish, and the length of female flagellomere I is  $1.8 \times$  the apical width. In *P. noctulum*, the punctures of the upper frons are less than one diameter apart, the propodeal dorsum is finely sculptured posterolaterally, the posterior propodeal surface has fine ridges that become evanescent dorsally, the wing veins are dark brown, and the length of female flagellomere I is  $1.5 \times$  the apical width.

**DESCRIPTION.**—Head globose in dorsal view (Fig. 694). Frons swollen above antennal socket





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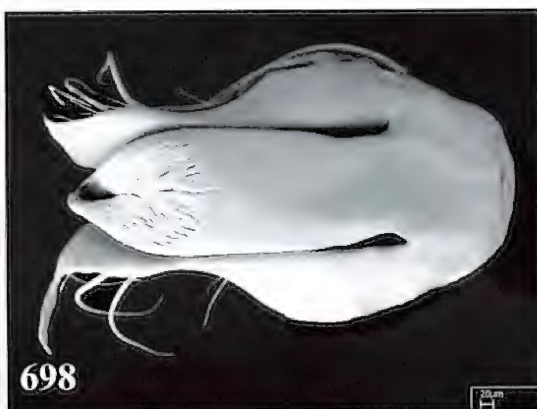
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FIGURES 692-696. *Pison noctulum* Turner. (692) Female clypeus; (693) Male clypeus; (694) Female head in dorsal view; (695) Female head in lateral view showing frontal swelling; (696) Apical part of forewing.



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(Fig. 695), dull, minutely punctate, punctures less than one diameter apart; middle supra-antennal carina absent. Midocellus smaller than hindocellus. Labrum not emarginate. Antero-median pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate (except densely in apical third or so). Scutum practically not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal and mesopleural punctures fine, less than one diameter apart, interspaces microsculptured, dull. Scutellum with foveate sulcus along anterior margin (sulcus inconspicuous in some specimens). Mesopleural punctures shallow, averaging less than one diameter apart; interspaces conspicuously microsculptured, dull. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with well-defined longitudinal carina separating dorsum and posterior surface from side and extending from gastral socket area toward spiracle; dorsum finely obliquely ridged (with ill-defined punctures between ridges), finely sculptured posterolaterally; side slightly concave, minutely ridged; posterior surface with fine ridges that become evanescent



FIGURES 697-699. *Pison noctulum* Turner, male. (697) Sternum VIII (ventral surface); (698) Genitalia in dorsal view; (699) Genitalia in lateral view.

dorsally. Forewing with two submarginal cells; second submarginal cell long: length of posterior margin  $1.8-1.9 \times$  its height (Fig. 696). Hindcoxal dorsum with outer margin carinate in posterior half. Punctures of tergum I minute, inconspicuous, less than one diameter apart; interspaces microareolate, dull. Sterna closely punctate throughout.

Setae silvery, appressed on thorax, forecoxal venter, femoral venters, and tergum I, suberect on each side of oral fossa (and about as long as  $0.5 \times$  midocellar diameter); apical depressions of terga with inconspicuous, silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, female clypeus black or ferruginous next to lobe free margin; mandible black basally, ferruginous preapically, dark apically; antenna black or ferruginous (scape, pedicel, and apical flagellomeres dark dorsally in most specimens, apical flagellomere all dark in some specimens). Femora, tibiae, and tarsi black (most specimens) or ferruginous.

♀.—Upper interocular distance equal to  $0.76 \times$  lower interocular distance. Ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.2 \times$  hindocellar diameter. Eye height equal to  $1.10 \times$  distance between eye notches. Middle clypeal lobe not differentiated, free clypeal margin evenly arcuate from orbit to orbit (Fig. 692). Dorsal length of flagellomere I  $1.5 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina without tooth or incision. Length 5.7 mm; head width 1.5 mm.

♂.—Upper interocular distance equal to  $0.8 \times$  lower interocular distance; ocellocular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Middle clypeal lobe not differentiated, free clypeal margin obtusely angular, with a sharp median point (Fig. 693). Flagellomeres V-X with tyloids. Dorsal length of flagellomere I  $1.4 \times$  apical width, of flagellomere X  $0.7 \times$  apical width. Sternum VIII shallowly, broadly emarginate (Fig. 697). Genitalia: Figs. 698, 699. Length 5.3-5.6 mm; head width 1.3-1.4 mm.



**GEOGRAPHIC DISTRIBUTION** (Fig. 700).— Australian Capital Territory, eastern New South Wales, eastern Queensland.

**RECORDS.**— **AUSTRALIA:** **Australian Capital Territory:** Black Mountain (1 ♀, CAS), Canberra (1 ♀, ACT). **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at 31°58.5'S 148°40.5'E (2 ♀, CAS), Warrumbungle National Park at 31°16'S 148°57'E (1 ♀, MNKB), Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E (1 ♀, CAS). **Queensland:** Cania Gorge National Park at 24°43'S 150°59'E (2 ♀, 1 ♂, ANIC), Currimundi Lake Conservation Park adjacent to Caloundra at 26°45.8'S 153°07.7'E (1 ♂, CAS), 9 km S Dingo Beach at 20°05.5'S 148°30.2'E (1 ♀, CAS), Eungella National Park at 21°10.5'S 148°30.3'E (6 ♀, 1 ♂, CAS), Kuranda (Turner, 1916b), Mackay (1 ♀, BMNH, lectotype of *Pison noctulum*), Split Rock at 15°39'S 144°31'E (1 ♀, ANIC).



FIGURE 700. Collecting localities of *Pison noctulum* Turner.

***Pison notochthonum* Pulawski, species nova**

Figures 701-707.

**NAME DERIVATION.**— *Notochthonum* is derived from two Greek words: νότος *south*, and ἀντόχθων, *aboriginal, indigenous*; with reference to this species occurrence in the southern part of Australia; a noun in apposition to the generic name.

**RECOGNITION.**— *Pison notochthonum* has an all black body, three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I.

The female is characterized by the presence of a psammophore on the lower gena and the forefemoral venter, and the lower gena unsculptured and shiny on each side of the oral fossa. It can be differentiated from most other such species by the tegula with well-defined punctures that cover all of its surface (except for the narrow marginal rim). The tegula is also punctate in *P. contiguum* and *P. dentatum*, from which the female of *P. notochthonum* differs in having many punctures of the upper frons one diameter apart or nearly so (rather than less than one diameter apart), the clypeal lamella with a small median projection (Fig. 701) rather than without projection, and the mesopleuron practically not crenulate along the anterior margin of the metapleuron (rather than markedly crenulate). Unlike *P. dentatum*, the inner mandibular margin of *P. notochthonum* is simple (rather than with two preapical teeth). The fully punctate tegula is also found in most *P. punctatum* in which, however, at least terga I-III and the tibiae are ferruginous (rather than black), and in *P. stenometopon*, in which the genal psammophore is as long as the midocellar diameter (markedly longer than midocellar diameter in *P. notochthonum*) and the forefemur has no psammophore (femoral psammophore present in *P. notochthonum*).

The male resembles *P. stenometopon* in having the tegula punctate throughout (except a narrow marginal rim), the mandible unidentate apically, and a black body. It differs from that species in having sterna VI and VII unsculptured, shiny (punctate in *P. stenometopon*), sternum V with appressed setae and sterna VI and VII asetose (sterna V-VII with short erect setae in *P. stenometopon*), and sternum VIII broadly emarginate apically (rather than rounded).

**DESCRIPTION.**— Frons with well-defined punctures averaging less than one diameter apart; in female, most punctures of upper frons one diameter apart or nearly so (Fig. 702); interspaces



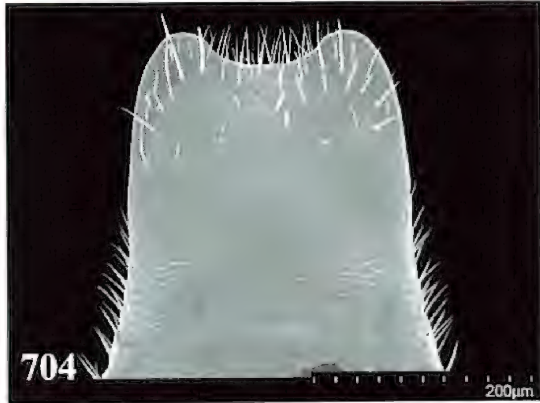
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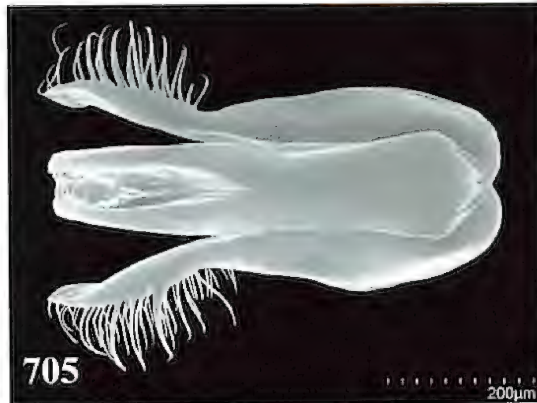
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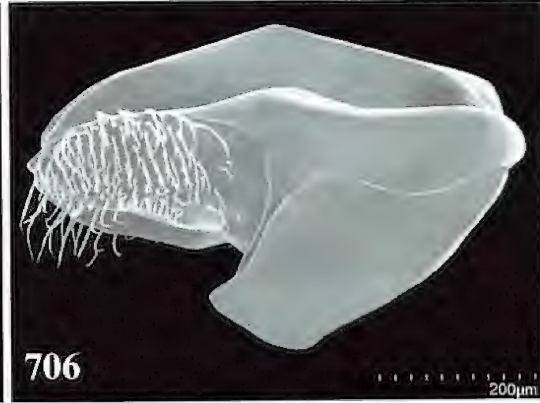
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FIGURES 701-706. *Pison notochthonum* Pulawski, sp. nov. (701) Female clypeus and mandibles; (702) Female upper frons; (703) Female tergum VI; male: (704) Sternum VIII (ventral surface); (705) Genitalia in dorsal view; (706) Genitalia in lateral view.



aciculate, slightly shiny. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum finely foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart. Tegula slightly enlarged, punctate throughout (except for narrow marginal rim), punctures well defined. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina ill defined, practically absent in female, in male about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with ill-defined longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent in some specimens, in some males replaced by series of ill-defined, transverse ridges); dorsum with well-defined punctures, interspaces with minute ridges (except ridges well defined basally in most specimens); side with well-defined punctures, with ridges that are conspicuous dorsally and evanescent ventrally; posterior surface punctate, with fine, irregular, transverse ridges. Posteroventral forefemoral surface in female minutely punctate (punctures several diameters apart), in male punctures of medium size, about one diameter apart. Outer surface of hindtibia with evanescent spines. Punctures of tergum I, anterior to apical depression, partly less than one diameter apart, partly about one diameter apart. Sternal punctures several diameters apart, sternum II impunctate apicomesally.

Setae silvery, appressed on postocellar area, scutum, and tergum I; not concealing integument on clypeus; genal setae: see below. Apical depressions of terga with silvery, setal fasciae.

Body all black except mandible reddish mesally.

♀.—Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $0.8-1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate, with small median projection (Fig. 701). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $1.0 \times$ ,  $1.0 \times$ , and  $1.1 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision at about two thirds of length. Tergum VI relatively broad (Fig. 703). Length 6.4-6.7 mm; head width 2.0-2.1 mm.

♂.—Upper interocular distance equal to  $0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $0.94-0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate. Dorsal length of flagellomere I  $1.5-1.7 \times$  apical width, of flagellomere X  $0.9-1.1 \times$  apical width. Sterna VI and VII impunctate, shiny; apical margin of sternum VIII shallowly, broadly emarginate (Fig. 704). Genitalia: Figs. 705, 706. Length 4.3-6.2 mm; head width 1.6-2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 707).—New South Wales, South Australia, Victoria.



FIGURE 707. Collecting localities of *Pison notochthomum* Pulawski, sp. nov.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: **South Australia:** 31 km N Renmark at 33°53'S 140°44'E, 12 Dec 1995 – 25 Jan 1996, K.R. Pullen (ANIC)

**PARATYPES:** **New South Wales:** 100 km SE Broken Hill at 32°51'S 141°36'E, 3-13 Oct 1988, E.D. Edwards (1 ♂, ANIC). **South Australia:** Danggali Conservation Park, J.A. Forrest, 21-24 Nov 1996 at 33°19'05"S 140°54'49"E (1 ♂, SAM) and 24-26 Nov 1996 at 33°19'39"S 140°42'50"E (1 ♀, SAM); 10 km NNW Penong at 31°50.3'S 132°57.9'E, 15 and 18 Jan 2011, V. Ahrens and W.J. Pulawski (2 ♀, CAS); 14 km WNW Renmark at 34°07'S 140°37'E, 13 Dec 1995 – 25 Jan 1996, K.R. Pullen (1 ♂, ANIC; 1 ♂, CAS); 31 km NW Renmark at 33°59'S 140°30'E, 7 Nov – 13 Dec 1995, K.R. Pullen (1 ♂, ANIC). **Victoria:** Wemen at 34°47'S 142°38'E, 23 Feb 2004, J. Carpenter and A. Davidson (1 ♂, AMNH).

***Pison novaecambriae* Pulawski, species nova**

Figures 708-715.

**NAME DERIVATION.**—*Novaecambriae*, a genitive of *Nova Cambria*, Latin for New Wales, an abbreviation for New South Wales, a noun of the Latin first declension.

**RECOGNITION.**—The female of *Pison novaecambriae* resembles those of *P. auratum*, *P. perplexum*, and *P. vestitum* in having the clypeal middle lobe slightly concave just above the lamella. Unlike *P. auratum*, it has the setae of the frons and clypeus silvery (rather than golden), the flagellum black (rather than flagellomere I to I-V yellowish reddish), and the gaster all black, and the apical depressions on terga (except tergum I) with silvery fasciae with golden tinge (rather than tergum I being ferruginous and/or the setae of tergum II being all black). It differs from *P. vestitum* in having the setae of tergum I appressed (rather than erect), those of the lower gena straight, curved apically (rather than sinuous), and the clypeal lamella narrower, with corners closer to each other than to the eye margin or equidistant (rather than closer to the eye margin than to each other). It differs from *P. perplexum* as follows: the propodeum has a longitudinal carina extending from the gastral socket area toward the spiracle and the dorsum is predominantly punctate, the transverse ridges of the propodeal posterior surface do not extend onto the propodeal side, the wing membrane is only slightly infumate, the tibiae are ferruginous, and the apical depressions of terga III-V are brown. In *P. perplexum*, the propodeum has no longitudinal carina extending from the gastral socket area toward the spiracle and the dorsum is irregularly ridged, the transverse ridges of the posterior propodeal surface extend onto the posteroventral part of the side, the wing membrane is conspicuously infumate, the tibiae are all black, and the apical depressions of terga III-V are black.

The male of *Pison novaecambriae* lacks any prominent distinctive feature and can be recognized only by a combination of a long suite of characters. It has the setae of the lower gena straight (curved apically), the flagellum cylindrical, without tyloids, dorsal length of flagellomere I 2.9-3.0 × apical width, the free margin of the clypeal lamella acutely angulate, mandible simple apically, the punctures of the mesopleuron and propodeal dorsum less than one diameter apart, tergum VII at most with a rudimentary median carina apically, its apical margin not emarginate or slightly emarginate, sterna II-VI evenly punctate, without any particular features, sternum VIII conspicuously emarginate apically but otherwise without any special characters (flat, punctate), and tibiae and tarsi ferruginous. It differs from *Pison marginatum* in having the punctures of the metapleuron about as large as those of the adjacent part of the propodeum (markedly smaller than those of the propodeum in *P. marginatum*).

The male of *P. novaecambriae* is strikingly similar to *P. vestitum*. They differ mainly by the setae of tergum I, appressed in the former and erect in the latter. In certain *P. novaecambriae* the setae are subappressed on the sides of tergum I, approaching the condition found in *P. vestitum*. In *P. vestitum*, however, the setae of the lower gena are sinuous, not straight and curved apically, as they are in *P. novaecambriae*.





FIGURES 708-711. *Pison novaecambriae* Pulawski, sp. nov. (708) Female clypeus and mandibles; (709) Male clypeus and mandibles; (710) Propodeal dorsum of female; (711) Female tergum VI.

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina expanded, joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate anteriorly. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures of medium size, less than one diameter apart; interspaces microsculptured. Tegula enlarged. Mesopleural punctures about as large as those on scutum, less than one diameter apart. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, punctures less than one diameter apart (Fig. 710), many interspaces merging into minute, inconspicuous ridges; side punctate, interspaces merging into minute ridges; posterior surface coarsely ridged, punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures more than one diameter apart. Hindcoxal dorsum with outer margin sharply carinate. Punctures of tergum I one diameter apart or less on horizontal area. Sternum II densely punctate throughout.

Setae silvery; erect on upper frons and also forming patch of appressed, laterally oriented setae on each side beneath midocellus; erect on scutum but considerably inclined in some males (scutal length varying from about 0.5 midocellar diameter in most specimens to slightly more than one midocellar diameter in some males); on lower gena straight, curved apically, subappressed to suberect, up to  $1.5 \times$  as long as midocellar diameter; not concealing integument on clypeus in



FIGURES 712-714. *Pison novaecambriae* Pulawski, sp. nov., male. (712) Sternum VIII (ventral surface); (713) Genitalia in dorsal view; (714) Genitalia in lateral view.

female, concealing (except lamella) in male; setae of tergum I appressed except suberect and up to one midocellar diameter long laterally in many males. Apical depressions of terga with setal fasciae; fascia silvery on tergum I, those on following terga with golden tinge.

Head (including antenna), thorax, and propodeum black, mandible brown mesally. Femora all black or largely ferruginous, tibiae

and tarsi ferruginous. Gaster black, apical depressions of terga brown, tergum I partly ferruginous in some females.

♀.— Upper interocular distance equal to  $0.66-0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.92-0.94 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 708); clypeal surface slightly concave just above lamella. Dorsal length of flagellomere I  $2.8-2.9 \times$  apical width, of flagellomere IX  $1.4-1.5 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length; acetabular carina, in some specimens, with two rows of punctures. Tergum VI elongate (Fig. 711), narrowly rounded apically, in some specimens with well-defined median carina. Length 10.5-14.2 mm; head width 2.8-3.4 mm.

♂.— Upper interocular distance equal to  $0.70-0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.0-1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.3 \times$  hindocellar diameter; eye height equal to  $0.88-0.92 \times$  distance between eye notches. Free margin of clypeal lamella sharply angulate (Fig. 709). Dorsal length of flagellomere I  $2.9-3.0 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Sternum VIII conspicuously emarginate apically (Fig. 712). Genitalia: Figs. 713, 714. Length 8.1-10.3 mm; head width 2.2-3.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 715).— Australian Capital Territory, New South Wales.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Australian Capital Territory: Canberra, 23 Dec 1979, E.McC. Callan (ANIC).

PARATYPES: AUSTRALIA: Australian Capital Territory: Black Mountain, 1 Apr and 9 June 1970, J.C. Cardale (2 ♀, ANIC); Canberra, E.McC. Callan, 12 Dec 1979 (1 ♀, 1 ♂, ANIC), 23 Dec 1979 (1 ♀, 1 ♂,



ANIC), 17 Jan 1980 (1 ♂, ANIC), 29 Jan 1980 (1 ♀, ANIC), 4 Feb 1980 (1 ♀, ANIC), 2 Mar 1980 (1 ♂, ANIC), 10 Nov 1980 (1 ♀, ANIC), 26 Nov 1980 (1 ♂, ANIC), and 22 Dec 1980 (1 ♀, ANIC). **New South Wales:** Gilgandra Flora Reserve at 31°39.7'S 148°46.3'E, 30 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Wahroonga, northern suburb of Sydney, 24 Nov 1975, A. Musgrave (1 ♂, AMS); Warrumbungle National Park at 31°16.9'S 148°59.1'E, V. Ahrens and W.J. Pulawski, 16 Dec 2009 (1 ♀, 1 ♂, CAS), 17 Dec 2009 (3 ♀, 2 ♂, CAS), 21 Dec 2009 (1 ♂, CAS), 22 Dec 2009 (1 ♀, CAS), and 24 Dec 2009 (2 ♂, CAS); Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E, V. Ahrens and W.J. Pulawski, 7 Jan 2012 (7 ♀, 2 ♂, CAS) and 8 Jan 2012 (3 ♀, CAS).



FIGURE 715. Collecting localities of *Pison novaecambriae* Pulawski, sp. nov.

***Pison nubilipenne* Pulawski, species nova**

Figures 716-720.

**NAME DERIVATION.**— *Nubilipennis* (neuter: *nubilipenne*) is derived from two Latin words: *nubilis*, Latin for *cloudy*, and *penna*, Latin for *wing*; with reference to this species partly cloudy wings.

**RECOGNITION.**— *Pison nubilipenne* is an all black species with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. The female (the male is unknown) can be recognized by the silvery setae completely concealing the clypeus and the ventral half of the frons (Fig. 717), in combination with the bicolored forewing: the medial and submedian cells are translucent, contrasting with the infumate remaining part of the wing (Fig. 719). The ocellocular distance equal to  $1.8 \times$  hindocellar diameter is a subsidiary recognition feature.

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 718). Labrum not emarginate. Anteromedian pronotal pit round, about as wide as half midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula enlarged. Mesopleural punctures fine, less than one diameter apart; interspaces merging into tiny ridges under scrobe. Postspiracular carina present, about half as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly obliquely ridged (ridges inconspicuous); side finely ridged, punctate between ridges; posterior surface conspicuously ridged, punctate between ridges. Posteroventral forefemoral surface minutely, closely punctate. Punctures of tergum I fine, less than one diameter apart. Sterna punctate throughout, punctures of sternum II about 2-3 diameters apart mesally.

Setae silvery, erect on postocellar area, appressed on scutum and tergum I (scutum with a few suberect setae as long as  $0.3 \times$  midocellar diameter); on lower gena suberect, curved apically, slightly shorter than midocellar diameter; completely concealing integument on clypeus and lower frons. Apical depressions of terga with silvery setal fasciae.

Body all black; forewing bicolored: medial and submedian cells translucent, contrasting with infumate remaining wing part (Fig. 718).



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FIGURES 716-719. *Pison nubilipenne* Pulawski, sp. nov., female. (716) Clypeus and mandibles; (717) Head in frontal view; (718) Head in dorsal view; (719) Left wings.

FIGURE 720. Collecting locality of *Pison nubilipenne* Pulawski, sp. nov.

♀.— Upper interocular distance equal to  $0.92 \times$  lower interocular distance; ocellocular distance equal to  $1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2 \times$  hindocellar diameter; eye height equal to  $0.84 \times$  distance between eye notches. Free margin of clypeal lamella widely, obtusely angulate (Fig. 716). Dorsal length of flagellomere I

$2.1 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 8.6 mm; head width 2.7 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 720).— Known from one locality in Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Queensland: Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$ , 28 Nov 2012, V. Ahrens and W.J. Pulawski (QMB).



***Pison nudigenale* Pulawski, species nova**

Figures 721-723.

**NAME DERIVATION.**— *Nudigenale* is derived from the Latin adjectives: *nudus* meaning *nude*, *bare*, and *genalis*, meaning *referring to the gena*; with reference to the impunctate and glabrous lower gena (on each side of the oral cavity).

**RECOGNITION.**— The female of *Pison nudigenale* (the male is unknown) shares with *P. gymnopareion* a unique combination of the lower gena impunctate and glabrous on each side of the oral cavity, with the glabrous area bordered by a psammophore, and the presence of erect setae on tergum I. The females of the two species are quite similar morphologically, but they differ by the shape of the clypeal lamella: in *P. nudigenale*, it is obtusely angulate and relatively narrow (its corners are closer to each other than to the adjacent orbit); in *P. gymnopareion*, it is evenly arcuate and markedly broader (its corners are closer to the adjacent orbit than to each other).

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart, middle supraantennal carina present, but covered by vestiture. Occipital carina slightly expanded ventrally, joining hypostomal carina. Mandible with abductor ridge. Gena narrow in dorsal view (Fig. 722). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate anteriorly. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, almost contiguous. Scutellum somewhat foveate along anterior margin. Tegula not enlarged. Mesopleural punctures well defined, contiguous. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged; side ridged, punctate between ridges; posterior surface ridged, with several ridges radiating up from transverse carina just above gastropodeal articulation. Posteroventral forefemoral surface with well-defined punctures less than one diameter apart. Punctures of tergum I about one diameter apart anterior to apical depression, uniform on anterior declivity. Punctures of sternum II several diameters apart (except laterally), sternum impunctate along midline; sterna III and IV with punctures several diameters apart, impunctate along midline.

Setae silvery, erect on postocellar area, thorax, forecoxal venter, femoral venters, and tergum I; completely concealing integument on clypeus (except for lamella); genal setae: see below. Apical depressions of terga with silvery, setal fasciae.

Body all black.



FIGURES 721-722. *Pison nudigenale* Pulawski, sp. nov., female. (721) Clypeus and mandibles; (722) Head in dorsal view.

♀.— Upper interocular distance equal to  $0.60 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 721). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere IX  $1.0 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $1.1 \times$ ,  $0.9 \times$ , and  $0.9 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision at about two thirds of length. Length 6.5 mm; head width 2.4 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 723).— Known from one locality in southern Queensland.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: Queensland:** Dynevor Lakes at  $28^{\circ}05'S$   $144^{\circ}12'E$ , 28 Sept, 1991, G. Daniels (QMB, registration number T228764).

**PARATYPES:** **AUSTRALIA: Queensland:** same data as holotype (1 ♀, CAS).



FIGURE 723. Collecting locality of *Pison nudigenale* Pulawski, sp. nov.

***Pison occidentale* Pulawski, species nova**

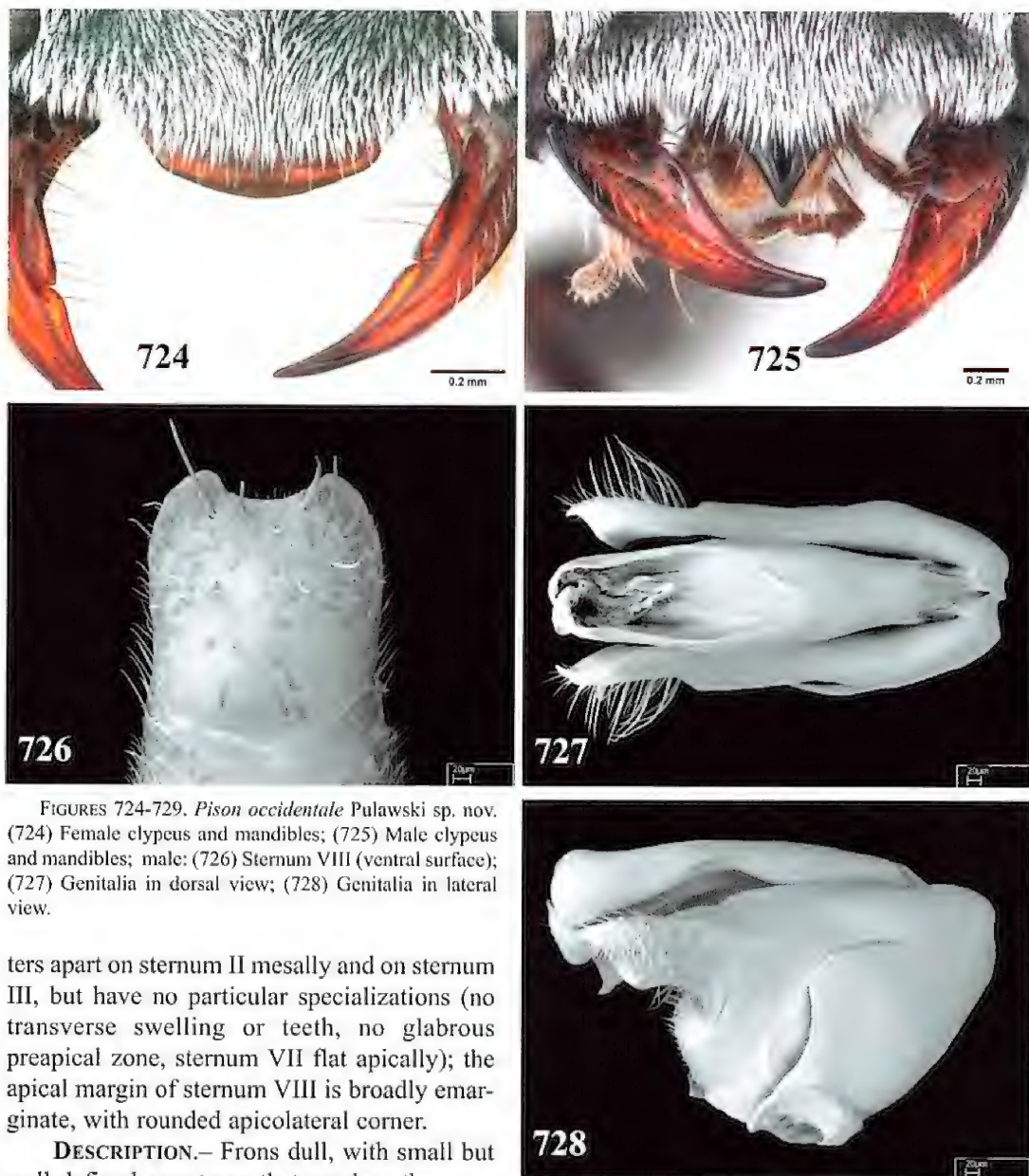
Figures 724-729.

**NAME DERIVATION.**— *Occidentalis* (neuter: *ccidentale*) is a Latin adjective meaning *western*; with respect to this species occurrence in Western Australia.

**RECOGNITION.**— *Pison occidentale* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. The female is characterized by the presence of a psammophore on the lower gena, mandible, posterolateral margin of propleuron, and forefemoral venter, and by the practically impunctate, unsculptured area on each side of the oral fossa. It differs from females of other species with these characteristics in having the following combination: propodeum at most with vestigial, short, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, mostly without such carina; propodeal dorsum, side, and posterior surface punctate, all or largely unridged; and propleuron impunctate and shiny anteriorly. A broadly arcuate clypeal lamella, with the corners closer to the adjacent orbit than to each other, is a subsidiary recognition feature.

In the male, the most distinctive character is the combination of the propleuron impunctate and shiny anteriorly and a uniformly, densely punctate propodeum (all surfaces), with the interspaces merging into inconspicuous ridges, and at most with vestigial, short, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, mostly without such carina. The following suite of characters helps in recognition: the clypeal lamella is acutely angulate with the lateral margin straight; the ocellocular distance is  $1.2\text{--}1.5 \times$  the hindocellar diameter; the flagellomeres are cylindrical, without tyloids; the dorsal length of flagellomere I is  $1.8\text{--}1.9 \times$  the apical width; the hypostomal carina is not expanded; the mesopleural punctures are less than one diameter apart; the sterna have well-defined punctures, several diame-





FIGURES 724-729. *Pison occidentale* Pulawski sp. nov.  
(724) Female clypeus and mandibles; (725) Male clypeus  
and mandibles; male; (726) Sternum VIII (ventral surface);  
(727) Genitalia in dorsal view; (728) Genitalia in lateral  
view.

ters apart on sternum II mesally and on sternum III, but have no particular specializations (no transverse swelling or teeth, no glabrous preapical zone, sternum VII flat apically); the apical margin of sternum VIII is broadly emarginate, with rounded apicolateral corner.

**DESCRIPTION.**—Frons dull, with small but well-defined punctures that are less than one diameter apart. Occipital carina expanded, not interrupted mesally, but narrowly separated from hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Propleuron impunctate and shiny anteriorly. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging more than one diameter apart in female from Neerabup, averaging less than one diameter apart in female from 34 km SE Kalbarri, in male averaging less than one diameter apart, but several punctures just behind center more than one diameter apart in most specimens; interspaces unsculptured. Tegula enlarged. Mesopleural punctures well defined but partly obscured by vestiture, less than one diameter apart; interspaces

unsculptured. Postspiracular carina present, about half as long to about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum at most with vestigial, short, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, mostly without such carina; dorsum punctate, with interspaces, in some specimens, merging near base into fine, irregular ridges; side and posterior surface punctate, interspaces merging into fine ridges. Posteroventral forefemoral surface with small but well-defined punctures that are one diameter apart or more. Punctures of tergum I fine but well defined, averaging about one diameter apart in front of apical depression mesally. Sternum II with punctures that are several diameters apart mesally, minute in female, well defined in male; sternum III with punctures that are several diameters apart.

Setae silvery, appressed on frons, scutum and tergum I, forecoxal venter, femoral venters, forming patch of dorsolaterally oriented setae on each side of upper frons (between dorsal end of middle carina and midocellus); completely concealing integument on clypeus (except lamella); genal setae: see below. Apical depressions of terga (including tergum II) with silvery, setal fasciae.

Head, thorax, propodeum, gaster, and legs black; mandible dark reddish except basally and apically.

♀.—Upper interocular distance equal to  $0.56\text{--}0.58 \times$  lower interocular distance; ocellular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella broadly arcuate, its corners closer to adjacent orbit than to each other (Fig. 724). Dorsal length of flagellomere I  $2.2 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Lower gena, mandibular posterior margin, propleural posterolateral margin, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $1.0 \times$ ,  $1.5 \times$ , and  $1.0 \times$ , respectively, of greatest forefemoral width); lower gena with a few sparse punctures, practically asetose, between oral fossa and psammophore. Mandible: trimmal carina with small incision shortly beyond midlength. Punctures near center of scutellum more than one diameter apart. Length 7.0–7.5 mm; head width 2.4–2.5 mm.

♂.—Upper interocular distance equal to  $0.80\text{--}0.82 \times$  lower interocular distance; ocellular distance equal to  $1.2\text{--}1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $0.92\text{--}0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 725). Dorsal length of flagellomere I  $1.8\text{--}1.9 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Lower gena with curved, subappressed setae (longest setae slightly longer than midocellar diameter). Sternum VIII with posterior margin shallowly, broadly emarginate (Fig. 726); apicolateral corner rounded. Genitalia: Figs. 727, 728. Length 5.9–7.3 mm; head width 2.0–2.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 729).—Known from three localities in Western Australia

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: Yanchep 32 mi. N Perth, 29 Jan – 8 Feb 1936, R.E. Turner (BMNH).

PARATYPES: AUSTRALIA: Western Australia: 34 km SE Kalbarri at  $27^{\circ}48.3'S$   $114^{\circ}26.2'E$ , 5 Nov 2008, V. Ahrens and W.J. Pulawski (1 ♀, 7 ♂, CAS); same data as holotype (1 ♀, BMNH); Neerabup 30 km N Perth, 11 Jan 1996, T.F. Houston (1 ♀, WAM).



FIGURE 729. Collecting localities of *Pison occidentale* Pulawski, sp. nov.



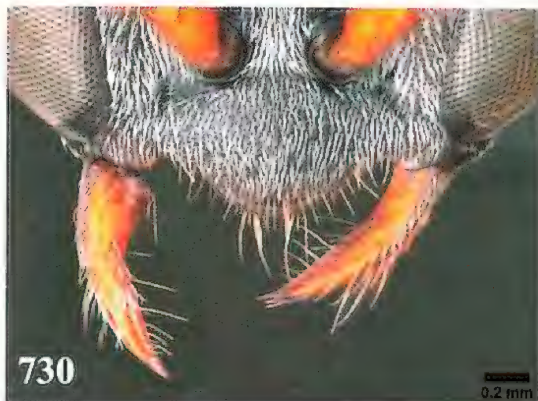
***Pison occultans* Pulawski, species nova**

Figures 730-733.

**NAME DERIVATION.**— *Occultans*, the present active participle of the Latin verb *occultare*, to cover; with reference to the tegula fully covering the humeral plate.

**RECOGNITION.**— *Pison occultans* is a small species (length of female 5.2 mm), with an all black gaster and the femora, tibiae, and tarsi all ferruginous. It can be recognized by the second recurrent vein received near the middle of the second submarginal cell, in combination with the tegula finely, entirely punctate and distinctly enlarged, fully covering the humeral plate (Fig. 732). Subsidiary recognition features are: the emargination of the inner eye margin is of the usual size, the scutal punctures are minute, less than one diameter apart, the propodeal dorsum has well-defined ridges, the gaster is sessile (length of tergum I smaller than apical width). In the female, the free margin of the clypeal lamella is obtusely rounded (Fig. 730). The male is unknown.

**DESCRIPTION.**— Frons dull, minutely punctate, punctures averaging less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 731). Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, less than one diameter apart; interspaces microsculptured. Scutellum foveate along anterior margin. Tegula enlarged, finely punctate throughout, fully covering humeral plate (Fig. 732). Mesopleural punctures fine, nearly confluent. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged (several ridges anastomosed); side ridged (ridges conspicuous dorsally, inconspicuous ventrally), punctate between ridges; posterior surface irregularly, transversely ridged, punctate between ridges. Forewing with three submar-



FIGURES 730-732. *Pison occultans* Pulawski, sp. nov., female. (730) Clypeus and mandibles; (731) Head in dorsal view; (732) Tegula and adjacent scutum.

ginal cells; second recurrent vein ending at about midlength of submarginal cell II. Hindcoxal dorsum with outer margin obtusely carinate anteriorly. Outer surface of hindtibia with evanescent spines. Punctures of tergum I anterior of apical depression fine but well defined, averaging about one diameter apart; interspaces unsculptured. Sterna finely punctate throughout, about 1-2 diameters apart on disk of sternum II.

Setae silvery, appressed on upper frons, postocellar area, scutum, femora, and tergum I, on frons all oriented ventrally; on lower gena suberect, straight, up to about  $0.5 \times$  midocellar diameter; not concealing integument on clypeus. Apical depressions of terga practically without setal fasciae.

Head, thorax, propodeum, and gaster black, but the following are ferruginous: antenna, mandible, tegula, wing veins, femora, tibiae, and tarsi.

♀.—Upper interocular distance equal to  $0.84 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.98 \times$  distance between eye notches. Free margin of clypeal lamella obtusely rounded (Fig. 730). Dorsal length of flagellomere I  $2.8 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina without incision. Length 5.2 mm; head width 1.4 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 733).—Known from one locality in northern part of Northern Territory.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Northern Territory: Gregory National Park at  $16^{\circ}12'47''\text{S}$   $130^{\circ}25'11''\text{E}$ , M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

PARATYPE: AUSTRALIA: Northern Territory: same data as holotype (1 ♀, CAS).



FIGURE 733. Collecting locality of *Pison occultans* Pulawski, sp. nov.

### *Pison oceanicum* Pulawski, species nova

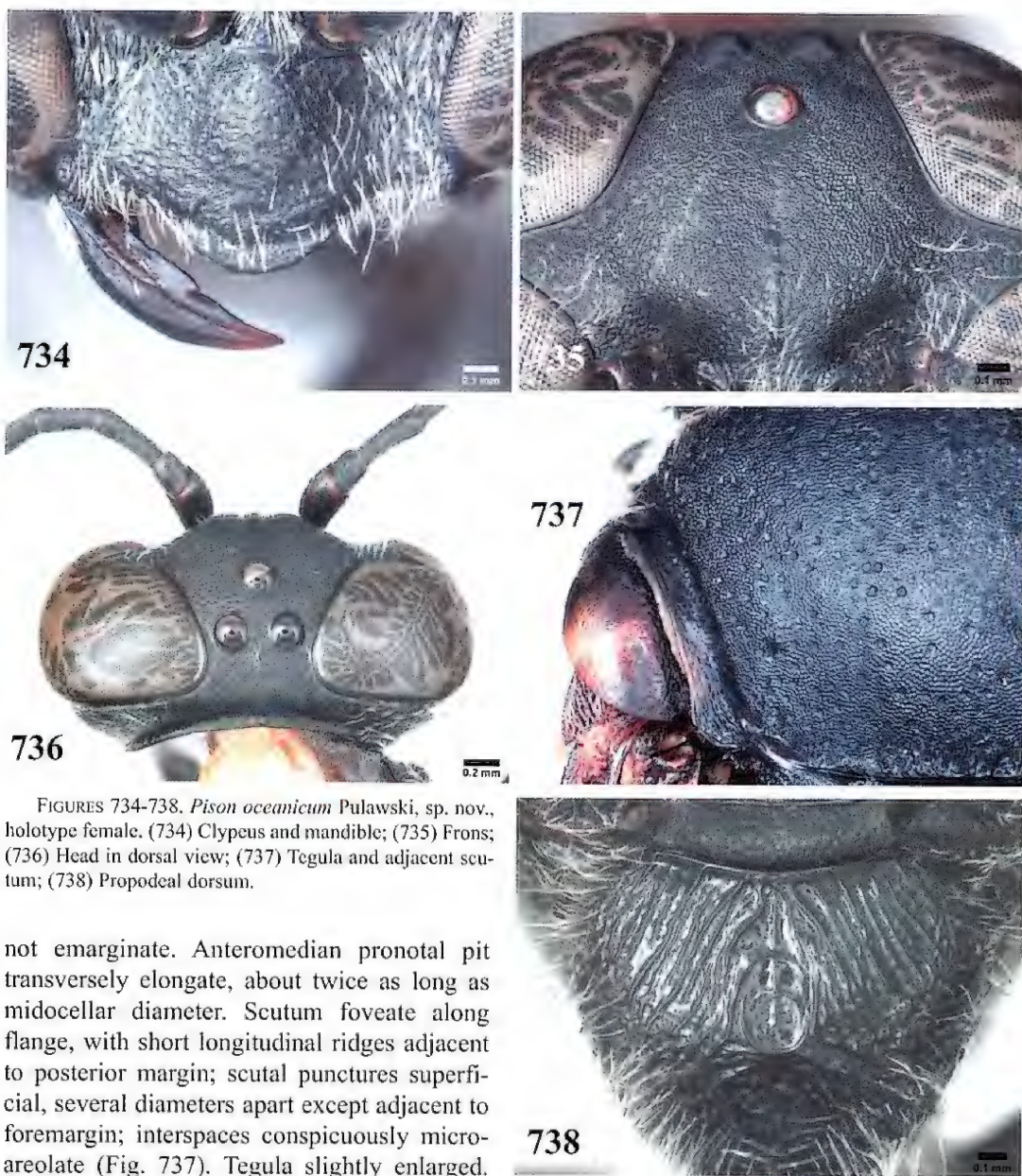
Figures 734-739.

**NAME DERIVATION.**—*Oceanicum*, Latin for *Oceanian*, refers to the fact that this species lives on a small island in the Indian Ocean.

**RECOGNITION.**—*Pison oceanicum* (known only from Christmas Island and only from the female sex) is characterized by the presence of erect setae on the side of the basal declivity of tergum I, the mesopleural punctures averaging more than one diameter apart in the center, and the propodeal dorsum and posterior surface ridged. These characters are shared with *P. spinolae*, from which *P. oceanicum* differs in having the scutal punctures of one size, the ocellocular distance equal to  $0.3 \times$  hindocellar diameter, the propodeum with a longitudinal carina separating the side from the dorsum and the posterior surface, and the body length of 7.0 mm. In *spinolae* the scutal punctures are of two sizes (small and minute), the ocellocular distance of the female is equal to  $0.6\text{--}0.7 \times$  hindocellar diameter (Fig. 736), the propodeum has no longitudinal carina separating the side from the dorsum and the posterior surface, and the body length of the female is 8.8-16.0 mm.

**DESCRIPTION.**—Frons swollen in profile, dull, finely punctate, punctures more than one diameter apart (Fig. 735). Distance between antennal socket and orbit slightly larger than socket diameter. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 736). Labrum





FIGURES 734-738. *Pison oceanicum* Pulawski, sp. nov., holotype female. (734) Clypeus and mandible; (735) Frons; (736) Head in dorsal view; (737) Tegula and adjacent scutum; (738) Propodeal dorsum.

not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures superficial, several diameters apart except adjacent to foremargin; interspaces conspicuously microareolate (Fig. 737). Tegula slightly enlarged. Mesopleural punctures superficial but well defined, at center averaging more than one diameter apart, interspaces conspicuously microareolate. Postspiracular carina present, slightly longer than midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum conspicuously, obliquely ridged (Fig. 738); side closely punctate, interspaces merging into fine, longitudinal ridges; posterior surface ridged (partly transversely, partly obliquely), punctate between ridges. Posteroventral forefemoral surface with small but well-defined punctures that average 2-3 diameters apart. Outer surface of hindtibia

with faint spines. Punctures of tergum I fine, averaging several diameters apart mesally. Sterna punctate throughout, punctures of sternum II several diameters apart mesally.

Setae silvery, appressed on postocellar area and tergum I, except erect on side of anterior declivity; on lower gena slightly sinuous, some of them up to  $2.0 \times$  midocellar diameters long; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6 \times$  hindocellar diameter (Fig. 736); eye height equal to  $0.88 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 734). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere IX  $1.5 \times$  apical width. Mandible: trimmal carina with minute incision at about two thirds length. Length 7.0 mm; head width 2.4 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 739).—Christmas Island.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Christmas Island: no specific locality, 8 July 1961, G.F. Mees (RMNH).



FIGURE 739. Collecting locality of *Pison oceanicum* Pulawski, sp. nov.

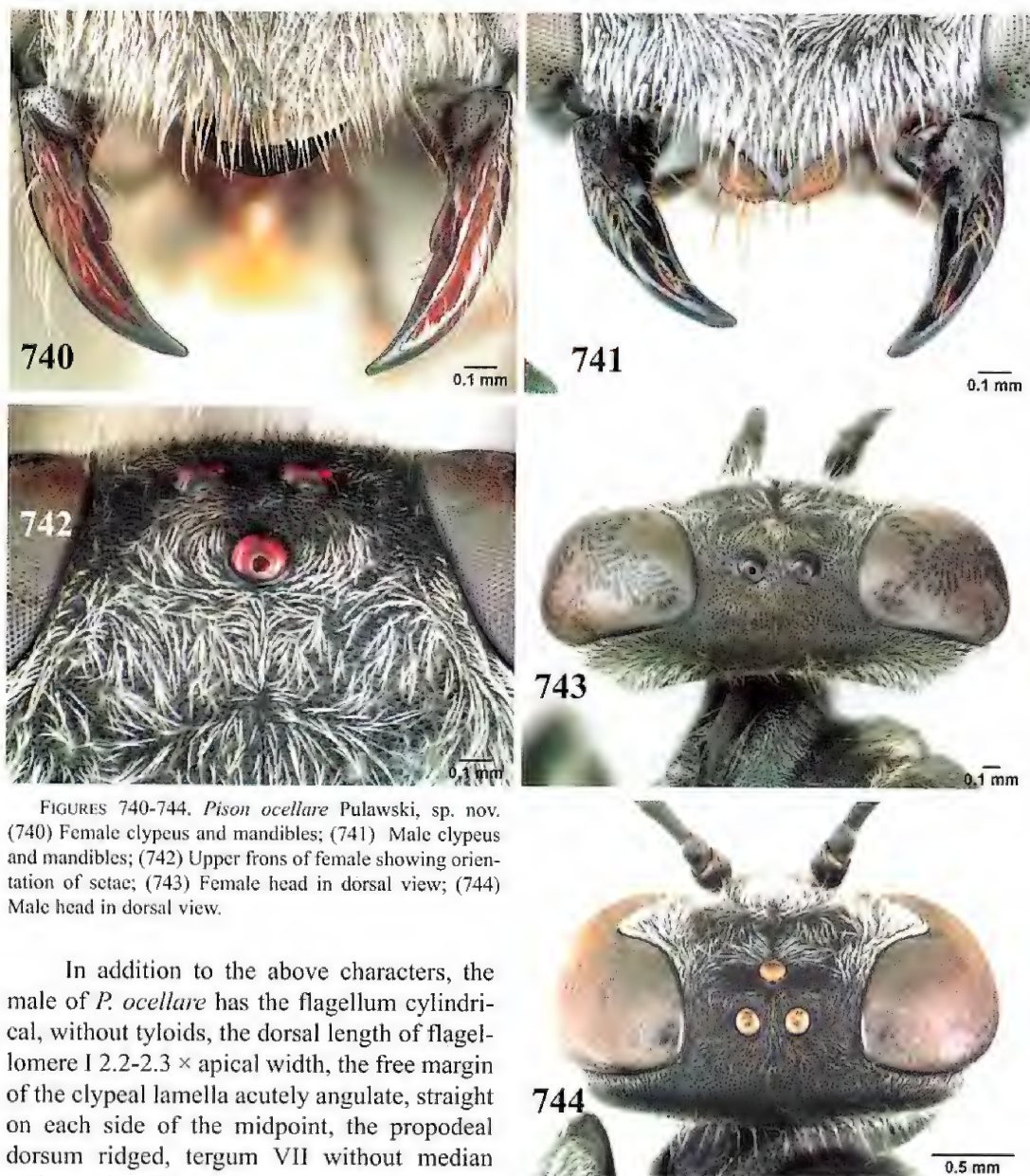
### *Pison ocellare* Pulawski, species nova

Figures 740-748.

**NAME DERIVATION.**—*Ocellare*, a Neolatin neuter adjective, is derived from *ocellus*; with reference to the large ocellocular distance combined with the small distance between the hindocelli.

**RECOGNITION.**—*Pison ocellare* is an all black species with three submarginal cells. In the female, the setae are erect on the side of tergum I, but in the male there are only a few erect setae or all the setae are appressed. Furthermore, the mandibular apex of *P. ocellare* is simple, the frontal punctures are small, no more than  $0.1-0.2 \times$  midocellar diameter, the gena is punctate and setose on both sides of the oral fossa, the scutal punctures are less than one diameter apart, the mesopleural punctures are less than one diameter apart at the center, the basodorsal hindcoxal tooth is inconspicuous, the apical depression of tergum I is inconspicuous, almost in the same plane as the adjacent more anterior part of tergum, the sterna are evenly, densely punctate (punctures well defined), and the scutal setae are erect and the genal setae are sinuous. Important recognition feature are: the ocellocular distance about twice the the distance between hindocelli (Figs. 743, 744) and sternum II mesally with punctures averaging 2-3 diameters apart. As in *P. tibiale* and *P. dispar*, most tergal setae are golden, forming well-defined fasciae on the apical depressions. Unlike the female of *P. tibiale* (in which the clypeal lamella is divided by an ill-defined, arcuate sulcus into dorsal and ventral portions), the clypeal lamella is simple in the female of *P. ocellare*, and unlike the male of that species, sternum VIII of *P. ocellare* has no setose median sulcus. Unlike *P. dispar*, the inclined part of tergum I is uniformly, finely punctate and the male gaster is black (in *P. dispar*, the inclined part of tergum I is covered with fine, dense punctures and also with somewhat larger, much sparser punctures that are several to many diameters apart and the male gaster is ferruginous).





FIGURES 740-744. *Pison ocellare* Pulawski, sp. nov. (740) Female clypeus and mandibles; (741) Male clypeus and mandibles; (742) Upper frons of female showing orientation of setae; (743) Female head in dorsal view; (744) Male head in dorsal view.

In addition to the above characters, the male of *P. ocellare* has the flagellum cylindrical, without tyloids, the dorsal length of flagellomere I  $2.2\text{--}2.3 \times$  apical width, the free margin of the clypeal lamella acutely angulate, straight on each side of the midpoint, the propodeal dorsum ridged, tergum VII without median carina, with the apical margin truncate, sternum VIII flat, uniformly sculptured, with the apical margin shallowly, broadly emarginate. Unlike *Pison formicarum*, *P. marginatum*, and *P. separatum*, *P. ocellare* has erect setae on the scutum (the setal length about equal to the midocellar diameter).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Female gena narrow in dorsal view (Fig. 743), male gena moderately broad (Fig. 744). Labrum not emarginate. Anteromedian pronotal pit oval, shorter than midocellar diameter. Scutum not foveate along flange, at most with evanescent, short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart;



FIGURES 745-747. *Pison ocellare* Pulawski, sp. nov., male. (745) Sternum VIII (ventral surface); (746) Genitalia in dorsal view; (747) Genitalia in lateral view.

interspaces conspicuously microsculptured. Mesopleural punctures slightly larger than those on scutum, less than one diameter apart at center. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending

from gastral socket area toward spiracle, with conspicuous, short transverse ridges emerging on its admedian side; dorsum irregularly obliquely ridged, punctate between ridges; side punctate, with interspaces merging into irregular ridges; posterior surface ridged. Posteroventral forefemoral surface with small but well-defined punctures that average 2-3 diameters apart. Punctures of tergum I averaging less than one diameter apart on horizontal part. Sterna punctate throughout, punctures minute on apical depression of sternum II.

Setae silvery, erect on upper frons, lower gena, and scutum (here about as long as midocellar diameter), oriented dorsally above dorsal end of midfrontal carina, oriented transversely immediately below midocellus (Fig. 742); not completely concealing integument on clypeus; setae of lower gena sinuous, about twice as long as midocellar diameter. Setae erect on side of tergum I in female, but in male only a few erect setae are present or all setae are appressed. Terga II-V in female, II-VI in male, with golden setae that form conspicuous fasciae on apical depressions.

Body all black except apical depressions of terga II-V in female (II-VI in male) brown.

♀.—Upper interocular distance equal to  $0.74-0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-0.9 \times$  hindocellar diameter (Fig. 743); eye height equal to  $0.92-0.94 \times$  distance between eye notches. Free margin of clypeal lamella roundly triangular (Fig. 740). Dorsal length of flagellomere I  $2.5-2.7 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 9.4-10.1 mm; head width 3.0-3.2 mm.

♂.—Upper interocular distance equal to  $0.88-0.90 \times$  lower interocular distance; ocellocular distance equal to  $1.8-2.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.1 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of



clypeal lamella acutely angulate (Fig. 741). Dorsal length of flagellomere I  $2.2\text{--}2.3 \times$  apical width, of flagellomere X  $1.2\text{--}1.3 \times$  apical width. Sternum VIII shallowly, narrowly emarginate; apicolateral arm nonprominent, broadly rounded (Fig. 745). Genitalia: Figs. 746, 747. Length 7.5–8.7 mm; head width 2.5–2.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 748). – South Australia, Queensland.

**RECORDS.**– **HOLOTYPE:** ♀, **AUSTRALIA: South Australia:** Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , 26 Jan 2011, V. Ahrens and W.J. Pulawski (SAM).

**PARATYPES:** **AUSTRALIA: Queensland:** ca 5 km N Biloela at  $24^{\circ}13.7'S$   $150^{\circ}34.7'E$ , 6 Dec 2006, W.J. Pulawski (1 ♂, CAS); Brisbane: Karawatha Forest at  $27^{\circ}38.6'S$   $153^{\circ}04.2'E$ , 12 Dec 2006, W.J. Pulawski (1 ♂, CAS). **South Australia:** same locality and collectors as holotype: 21 Dec 2011 (1 ♀, 1 ♂, CAS), 22 Dec 2010 (1 ♀, CAS), 26 Jan 2011 (2 ♀, CAS); 3 km ENE Wilpena at  $31^{\circ}31.0'S$   $138^{\circ}36.6'E$ , 26 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS).



FIGURE 748. Collecting localities of *Pison ocellare* Pulawski, sp. nov.

***Pison oculare* Pulawski, species nova**

Figures 749–753.

**NAME DERIVATION.**– *Oculare* is the Latin neuter adjective meaning *ocular*; with reference to the shallowly emarginate eyes of this species.

**RECOGNITION.**– Like *Pison orbitale*, *P. oculare* has an unusually shallow eye emargination, whose depth is less than half of midocellar diameter (Fig. 750), whereas in all other *Pison* the emargination is about as deep as the midocellar diameter. Both species also have a fine omalus, which is found only exceptionally in the other *Pison* (e.g., *P. tenebrosus*). Additionally, the second recurrent vein is received near the midlength of the second submarginal cell (Figs. 751, 752). See *Pison orbitale* for differences between the two species (p. 317).

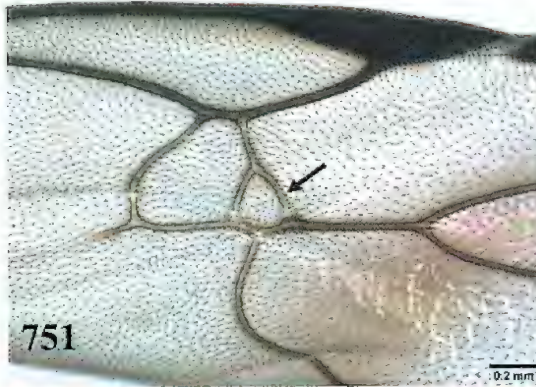
**DESCRIPTION.**– Frons dull, minutely punctate, punctures less than one diameter apart. Occipital carina narrowly separated from hypostomal carina. Gena narrow in dorsal view. Eye emargination unusually shallow, less than half as deep as midocellar diameter (Fig. 750). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, interspaces linear, microsculptured, dull. Tegula enlarged. Mesopleuron with fine omalus (closer to anterior margin than in *orbitale*); mesopleural punctures markedly larger than those on scutum, interspaces linear. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter; integument depressed between postocellar carina and episternal sulcus. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina obscured dorsally by adjacent rugae); dorsum conspicuously rugose, with middle carina but without sulcus; side ridged, punctate between ridges; posterior surface irregularly rugose (specimen from Wilpena) or irregularly ridged (specimen from Taree area), with several conspicuous ridges radiating up from transverse carina just above gastropropodeal articulation. Forewing with three submarginal cells (Figs. 751, 752), submarginal cell II greatly reduced in size in specimen from Taree area (Fig. 752), its height about 0.2 of distance that separates it from marginal cell; second recurrent vein ending near middle of submarginal cell II.



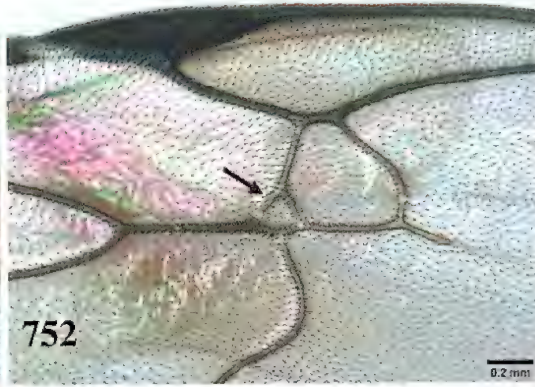
749



750



751



752



753

FIGURES 749-752. *Pison oculare* Pulawski, sp. nov., female. (749) Clypeus and mandibles; (750) Head in frontal view; (751) Portion of left forewing (arrow shows second submarginal cell); (752) Portion of right forewing (arrow shows second submarginal cell).

FIGURE 753. Collecting localities of *Pison oculare* Pulawski, sp. nov.

Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with minute spines. Punctures of tergum I, on horizontal part, about one diameter apart. Sterna punctate throughout, punctures well defined, averaging

about two diameters apart at center of sternum II.

Setae silvery, appressed on frons, postocellar area, thorax, and tergum I, suberect, shorter than midocellar diameter on lower gena, not concealing integument on clypeus. Apical depressions of terga without setal fasciae.

Head, thorax, propodeum, and gaster black, clypeal lamella brown or ferruginous, mandible ferruginous, brown apically, scape, pedicel, and basal half of flagellum ferruginous, apical half of flagellum dark brown. Femora, tibiae, and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2 \times$  hindocellar diame-



ter; eye height equal to  $1.14-1.16 \times$  distance between eye notches. Clypeus mesally with well-defined punctures, many of which are more than one diameter apart; free margin of lamella slightly, evenly arcuate, rounded laterally (Fig. 749). Dorsal length of flagellomere I  $2.1-2.3 \times$  apical width, of flagellomere IX  $1.5 \times$  apical width. Mandible: trimmal carina without incision; acetabular groove with two rows of punctures. Length 4.6-5.9 mm; head width 1.6-1.7 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 753).—New South Wales, South Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: New South Wales: Doyle's River 50 km NW Taree at  $31^{\circ}31'S$   $152^{\circ}14'E$ , 15 Nov 2009, D. Bray (AMS).

PARATYPE: AUSTRALIA: South Australia: Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , 22 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♀, CAS).

***Pison orbitale* Pulawski, species nova**

Figures 754-763.

**NAME DERIVATION.**—*Orbitale* is a Latin neuter adjective pertaining to the noun *orbita*; with reference to the unusual shape of the eye orbits in this species.

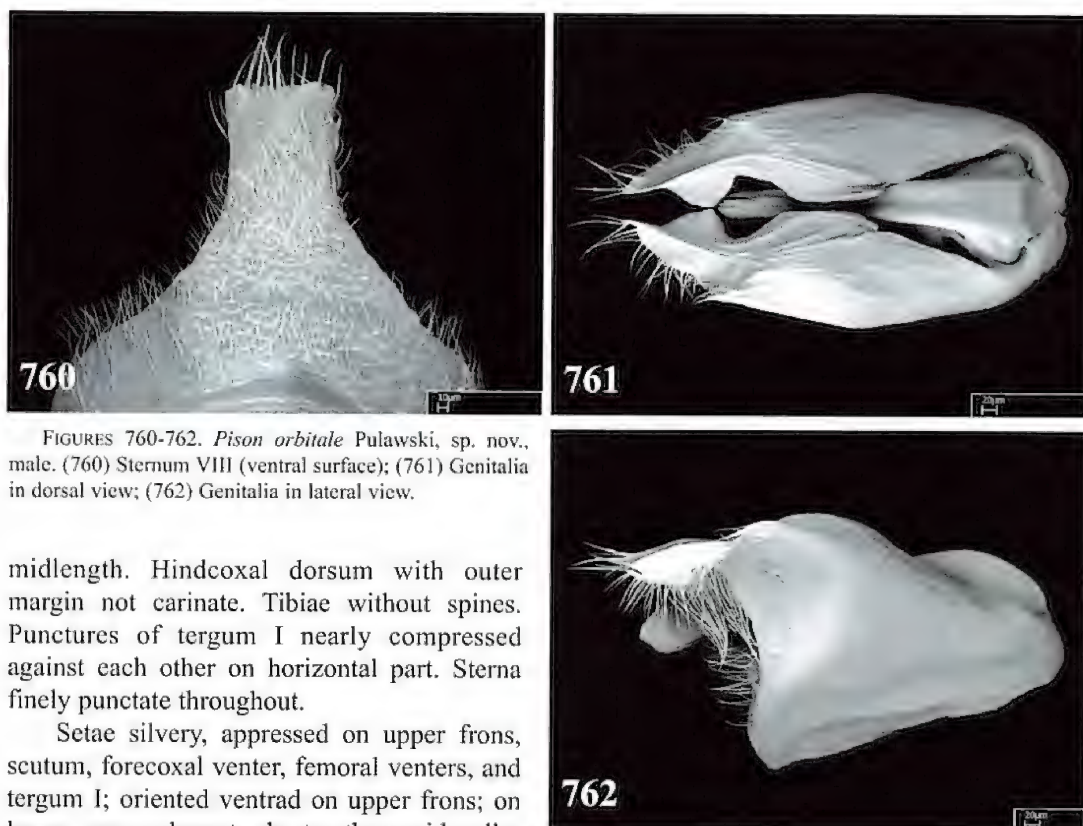
**RECOGNITION.**—*Pison orbitale* shares with *P. oculare* (of which only the female is known) an unusually shallow eye emargination: its depth is less than half midocellar diameter (Fig. 756), whereas in all other *Pison* the emargination is about as deep as midocellar diameter (e.g., Fig. 1176). Additionally, both species have a fine omalus, the hindtibial spines are evanescent, and the second recurrent vein joins the second submarginal cell near its midlength. *Pison orbitale* differs from *P. oculare* in having the following: clypeus above lamella with transverse, mesally interrupted swelling, its punctures separated by linear interspaces; free margin of clypeal lamella slightly concave on each side of midpoint and angular laterally (Fig. 754); ocellocular distance greater than hindocellar diameter ( $1.2-1.5 \times$  hindocellar diameter in female and  $1.3-1.5 \times$  in male); tegula punctate throughout, totally concealing humeral plate; mesopleuron with ill-defined hypersternaulus; hindtibia without spines; gaster ferruginous, at least partly so. In *P. oculare*, the clypeus has no transverse swelling, its surface has well-defined punctures medially, many of which are more than one diameter apart, the free margin of the clypeal lamella is slightly, evenly arcuate, rounded laterally (Fig. 749), the ocellocular distance is about equal to the hindocellar diameter, the tegula is partly impunctate, only partly concealing the humeral plate, the mesopleuron has no hypersternaulus, the hindtibia has minute spines on the outer surface; and the gaster is black.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Eye emargination unusually shallow, its depth less than half of midocellar diameter (Fig. 756). Occipital carina slightly expanded ventrally, joining hypostomal carina. Gena narrow in dorsal view (Fig. 757). Clypeal punctures separated by linear interspaces. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum foveate along flange, with longitudinal ridges adjacent to posterior margin; scutal punctures fine, compressed against each other (Fig. 758). Tegula enlarged, finely punctate throughout (Fig. 758). Mesopleuron punctatorugose, with fine omalus and ill-defined hypersternaulus. Postspiracular carina present but ill defined, about as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum conspicuously rugose (Fig. 759); side irregularly ridged; posterior surface rugose, with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Forewing with three submarginal cells; second recurrent vein joining submarginal cell II near its



FIGURES 754-759. *Pison orbitale* Pulawski, sp. nov. (754) Female clypeus and mandible; (755) Male clypeus and mandible; (756) Female head in frontal view; (757) Female head in dorsal view; (758) Female tegula and adjacent scutum; (759) Propodeal dorsum of female.





FIGURES 760-762. *Pison orbitale* Pulawski, sp. nov., male. (760) Sternum VIII (ventral surface); (761) Genitalia in dorsal view; (762) Genitalia in lateral view.

midlength. Hindcoxal dorsum with outer margin not carinate. Tibiae without spines. Punctures of tergum I nearly compressed against each other on horizontal part. Sterna finely punctate throughout.

Setae silvery, appressed on upper frons, scutum, forecoxal venter, femoral venters, and tergum I; oriented ventrad on upper frons; on lower gena suberect, shorter than midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with silvery, mesally interrupted setal fasciae.

Head, thorax, and propodeum black, clypeus yellowish brown in some females next to lamella free margin; flagellum light brown ventrally in some specimens; mandible black basally and brown apically, varying from black to yellowish brown in between. Femora, tibiae and tarsi varying from all ferruginous to all black. Gaster all ferruginous or apical segment dark, but segments IV-VII black in most males, and only apical part of tergum I and median part of tergum II ferruginous in specimen from Cobourg Peninsula, Northern Territory.

♀.—Upper interocular distance equal to  $0.92 \times$  lower interocular distance; ocellocular distance equal to  $1.2-1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.3 \times$  hindocellar diameter; eye height equal to  $1.02-1.12 \times$  distance between eye notches. Clypeus shortly above lamella with transverse swelling extending from orbit to orbit but interrupted mesally, slightly concave beneath carina; free margin of lamella slightly concave on each side of midpoint, angular laterally (Fig. 754). Dorsal length of flagellomere I  $2.0-2.3 \times$  apical width, of flagellomere IX  $0.7 \times$  apical width. Mandible: trimmal carina without incision. Length 4.9-5.6 mm; head width 1.6-1.9 mm.

♂.—Upper interocular distance equal to  $0.96-1.0 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.3 \times$  hindocellar diameter; eye height equal to  $1.08-1.10 \times$  distance between eye notches. Free margin of clypeal lamella pointed mesally (Fig. 755). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere X  $0.9-1.0 \times$  apical width. Sternum VIII truncate apically (Fig. 760). Genitalia: Figs.

761, 762. Length 4.6–4.9 mm; head width 1.4–1.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 763).—Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **Western Australia:** Mount Augustus National Park at 24°18.0'S 116°47.6'E, 25 Apr – 7 May, M.E. Irwin and F.D. Parker (ANIC).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Black Point in Cobourg Peninsula at 11°09'S 132°09'E, 31 Jan 1977, E.D. Edwards (1 ♂, ANIC); Fogg Dam 74 km E Darwin, 17 Sept 1979, H.E. and M.A. Evans (1 ♀, QMB); Gregory National Park at 15°36'43"S 130°24'08"E, 6–12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC), 16°00'52"S 130°48'18"E, 18–19 June 2001, M.E. Irwin and F.D. Parker (2 ♀, 1 ♂, ANIC), 16°03'01"S 130°24'07"E, 6–20 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS), 16°06.6'S 130°25.7'E, 24 May – 4 June 2001 and 4–12 June 2001, same collectors (2 ♀, ANIC), and 16°06'42"S 130°25'23"E, 24 May – 5 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS); Surprise Creek 45 km SSW Borroloola at 16°25'S 135°05'E, 5 Nov 1975, J.C. Cardale (1 ♀, ANIC). **Queensland:** Hann River at 15°11'S 143°52'E, 20 Oct – 17 Nov 1993, P. Zborowski and M. Horak (1 ♀, ANIC); Split Rock 14 km SE Laura at 15°39'S 144°31'E, 24 June – 29 July 1992, P. Zborowski and E.S. Nielsen (1 ♀, ANIC), 29 June – 24 Aug 1992, P. Zborowski and J.C. Cardale (1 ♀, ANIC), 13 Dec 1992 – 18 Feb 1993, P. Zborowski (1 ♀, CAS). **South Australia:** Monaree Station 8.8 km SE Monaree Hill at 31°59'06"S 135°39'36"E, 15–20 Oct 2006, WHC Monaree Survey (1 ♀, AMS). **Western Australia:** Cape Range National Park: Mandu Mandu Creek at 22°08'S 113°52'E, 11–12 July 2002, D.J. Bickel (1 ♂, CAS); Great Northern Highway 45 km S Newman at 23°42.4'S 119°44.3'E, 24 Apr 6 – May 2003, M.E. Irwin and F.D. Parker (1 ♂, ANIC); Kennedy Range National Park at 24°38.7'S 115°10.7'E, 26 Apr – 10 May 2003, F.D. Parker and M.E. Irwin (1 ♀, CAS); Mount Augustus National Park at 24°18.0'S 116°47.6'E, 25 Apr – 7 May 2003, M.E. Irwin and F.D. Parker (3 ♀, 3 ♂, CAS), 24°22.8'S 116°54.2'E, 25 Apr – 7 May 2003, M.E. Irwin and F.D. Parker (1 ♀, CAS), 9–23 May 2003, F.D. Parker and M.E. Irwin (2 ♀, CAS); 65 km E Nanutarra Roadhouse at 22°27.8'S 116°02.6'E, 5–12 May 2003, M.E. Irwin and F.D. Parker (2 ♀, CAS); Nanutarra – Wittenoom road at 22°21'21"S 117°54'16"E, 30 Sept – 5 Oct 2004, CVA [= Conservation Volunteers Australia] (2 ♂, SAM)



FIGURE 763. Collecting localities of *Pison orbitale* Pulawski, sp. nov.

### *Pison ovale* Pulawski, species nova

Figures 764–771.

**NAME DERIVATION.**—*Ovalis* (neuter: *ovale*), Latin neuter adjective meaning *oval*, with reference to the shape of male sternum VIII.

**RECOGNITION.**—*Pison ovale* is an all black species with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, tegula partly impunctate and asetose, and setae appressed on tergum I and sinuous on the lower gena. The female differs from the other species with the setae appressed on tergum I in having the clypeal lamella divided by an arcuate sulcus into a dorsal and a ventral portion (Fig. 765); the two portions are in slightly different planes. The male can be recognized by a unique combination of three sternal characters (Fig. 767): a shiny, somewhat convex, transverse area on each side of sterna III and IV at about midlength; erect setae (about as long as midocellar diameter) on posterior part of sterna III–VII; and the lateral margin of sternum VIII rounded, slightly raised over the flat ventral surface (surface all punctate except basally, punctures of two distinct sizes), and the apical margin slightly emarginate (practically rounded in some specimens), with the apicolateral corner rounded (Fig.



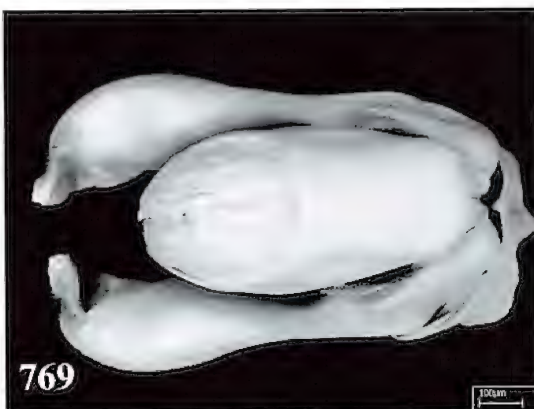


FIGURES 764-767. *Pison ovale* Pulawski, sp. nov. (764) Female clypeus and mandibles in frontal view; (765) Clypeal lamella of female in lateral oblique view (arrow shows sulcus); (766) Male clypeus and mandibles; (767) Male gaster in lateral oblique view.

768). A subsidiary recognition feature is the propodeum in which the lateral carina between the spiracle and the propodeal dorsum is either absent or short, rudimentary.

**DESCRIPTION.**—Frons dull, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Labrum minimally, shallowly emarginate. Anteromedian pronotal pit transversely elongate, almost twice as long as midocellar diameter. Propleural punctures several diameters apart (except near margins). Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures less than one diameter apart, interspaces microsculptured. Tegula enlarged. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina rudimentary. Metapleural sulcus practically not costulate between dorsal and ventral metapleural pits. Propodeum at most with rudimentary longitudinal carina between side and posterior surface; dorsum obliquely ridged (punctate between ridges); side punctate, interspaces merging into minute, irregular ridges; posterior surface ridged and punctate (except for median sulcus). Punctures of tergum I averaging more than one diameter apart at center of horizontal part. Sterna punctate throughout, punctures well defined.

Setae silvery, both appressed and erect on frons and gena, appressed on scutum and tergum I, appressed setae oriented ventrolaterally on each side of upper frons (between dorsal end of middle carina and midocellus); sinuous on lower gena; largely concealing integument on clypeus; erect setae on frons ranging from  $0.9$  to  $1.3 \times$  midocellar diameter, on lower gena as long as  $1.0 \times$  midocellar diameter. Apical depressions of terga with silvery, setal fasciae.



Figures 768-770. *Pison ovale* Pulawski, sp. nov., male. (768) Sternum VIII (ventral surface); (769) Genitalia in dorsal view; (770) Genitalia in lateral view.

Body all black, in some specimens mandible dark reddish mesally and tarsi dark brown apically.

♀.— Upper interocular distance equal to  $0.60-0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $0.90-0.94 \times$  distance between eye notches.

Clypeal lamella divided by arcuate sulcus into dorsal and ventral portions (Fig. 765), the two portions are in slightly different planes; free margin of lamella obtusely angulate (Fig. 764). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere IX  $1.2-1.3 \times$  apical width. Mandible: trimmal carina with small incision that delimits small tooth shortly beyond midlength (Fig. 764). Length 7.6-9.0 mm; head width 2.5-2.8 mm.

♂.— Upper interocular distance equal to  $0.76-0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.3 \times$  hindocellar diameter; eye height equal to  $0.92-0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 766). Dorsal length of flagellomere I  $1.8-2.0 \times$  apical width, of flagellomere X  $1.1-1.2 \times$  apical width. Sterna III and IV with shiny, somewhat swollen, transverse area on each side at about midlength (Fig. 767); posterior part of sterna III-VIII with erect setae (about as long as midocellar diameter). Sternum VIII with lateral margin rounded, slightly raised over ventral surface, surface flat, all punctate except basally (punctures of two distinct sizes); apical margin slightly emarginate (practically rounded in some specimens), with apicolateral corner rounded (Fig. 768). Genitalia: Figs. 769, 770. Length 7.0-9.2 mm; head width 2.3-2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 771).— New South Wales, Queensland, Tasmania, Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: New South Wales: 6 km NE Bilpin in Blue Mountains, 10 Apr 1983, N.W. Rodd (AMS).

PARATYPES: AUSTRALIA: Australian Capital Territory: Black Mountain, 8 Jan 1988, M.E. Irwin (1 ♂, UCD). New South Wales: 6 km NE Bilpin, 10 Apr 1983, N.W. Rodd (1 ♂, AMS); Clarence, 17 Jan 1979,



2 Feb 1979, and 13 Dec 1983, N.W. Rodd (3 ♂, AMS); Gibraltar Range National Park, 6 Oct 1992, D. Bickel (1 ♂, ANIC); Gilgandra Flora Reserve at 31°39.7'S 148°46.3'E, 30 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Iluka, 13 Nov 1990, N.W. Rodd (1 ♂, AMS); 15 mi. W Mullaley, 5 Dec 1971, C.G. Roche (1 ♂, CAS); Nadgee Nature Reserve 10 km S Newton's Beach, E.A. Sugden, 4 Dec 1986 (2 ♂, UCD) and 15 Jan 1987 (1 ♂, ANIC); 40.5 km SW Narrabri at 30°37.7'S 149°34.1'E, 5 Jan 2012, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Pearl Beach, 8 Feb 1985, D.B. McCorquodale (1 ♂, ANIC); Whiskers 7 km WNW Hoskinstown at 35°24'S 149°23'E, 1 Jan 1993 and 2 Feb 1993, M.S. Upton (2 ♂, ANIC); Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E, 7 and 8 Dec 2012, V. Ahrens and W.J.



Figure 771. Collecting localities of *Pison ovale* Pulawski, sp. nov.

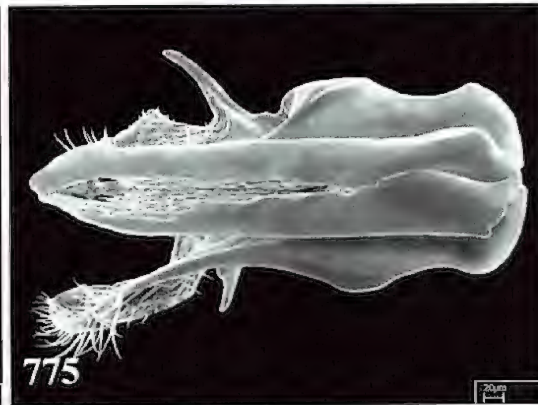
Pulawski (2 ♂, CAS). **Queensland:** Batavia Downs at 12°40'S 142°39'E, 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (1 ♂, ANIC); 4 km NE Batavia Downs at 12°39'S 142°42'E, 18 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC); 7 km S Batavia Downs at 12°43'S 142°42'E, 19 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC); Brisbane Botanic Gardens at 27°27.8'S 152°58.1'E, 20 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♂, CAS); near Brisbane Forest Park at 27°26.0'S 152°55.4'E, 19 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♀, 3 ♂, CAS); Brisbane: Karawatha Forest at 27°38.6'S 153°04.2'E, 12 Dec 2006, W.J. Pulawski (1 ♀, 1 ♂, CAS); Carnarvon National Park, 22–25 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♀, QMB); Coen at 13°57'S 143°12'E, 13 Sept – 20 Oct 1993, P. Zborowski and D. Rentz (1 ♂, ANIC); 5 km NE Leyburn, 26 Dec 1987, M. Irwin (1 ♀, CAS); 8–15 km E Mareeba, 17 May 1987, H.E. and M.A. Evans (1 ♂, ANIC); Mount Walsh National Park via Biggenden, 17 Oct 1975, H. Frauca (1 ♀, ANIC); 1 km N Rounded Hill near Hope Vale Mission at 15°17'S 145°13'E, 5–6 Oct 1980, J.C. Cardale (1 ♂, ANIC); 13 km SE Weipa at 12°40'S 143°00'E, 15 Aug – 12 Sept 1993, P. Zborowski and S. Shattuck (3 ♂, ANIC); Woodgate 35 km E Childers, 7 Nov 1984, N.W. Rodd (1 ♂, AMS). **Tasmania:** 1 km SSE Gladstone at 40°58'S 148°01'E, 29 Jan 1983, I.D. Naumann and J.C. Cardale (1 ♂, ANIC); 5 km SE Harford at 41°15'S 146°36'E, 19 Jan 1983, I.D. Naumann and J.C. Cardale (1 ♂, ANIC); Mount William National Park at 40°52'S 148°10'E, 19 Jan 1992, G. and A. Daniels (1 ♂, QMB); The Lea at 42°56'S 147°19'E, 5 Feb 1983, I.D. Naumann and J.C. Cardale (1 ♂, ANIC). **Western Australia:** Israelite Bay, 10 Dec 1974, S. Barker (1 ♂, SAM); 36 km ESE Minnie Creek Homestead at 24°02'S 115°42'E, 2 Sept 1980 C.A. Howard and T.F. Houston (1 ♂, WAM); NE foot of Whoogarup Range in Fitzgerald River National Park, 1–3 Jan 1979, T.F. Houston (1 ♂, WAM).

### *Pison parvum* Pulawski, species nova

Figures 772–777.

**NAME DERIVATION.**—*Parvum* is a Latin neuter adjective, meaning *small*; with reference to this species small size.

**RECOGNITION.**—*Pison parvum* is a small (length of male 4.8–5.3 mm), all black species (hind-tarsus ferruginous in some specimens), with the second recurrent vein contiguous with the second intersubmarginal vein, and the setae appressed on tergum I. The male (the female is unknown) is primarily characterized by a roundly arcuate clypeal lamella (Fig. 772), not acutely angulate, and by sternum VIII not emarginate apically and rounded apicolaterally (Fig. 774). It differs from most such species in having sternum II punctate throughout, although the apicomedian punctures can be minute and sparse. *Pison subtile* is similar, but differs by several prominent characters: its tibiae and tarsi are ferruginous (at least the tibiae are black in *P. parvum*), flagellomeres III and IV are



FIGURES 772-776. *Pison parvum* Pulawski, sp. nov., male. (772) Clypeus and mandible; (773) Head in dorsal view; (774) Sternum VIII (ventral surface); (775) Genitalia in dorsal view (right gonocoxite bent under); (776) Genitalia in lateral view.

concave basoventrally and expanded apicoven-  
trally (cylindrical in *P. parvum*), the scutal  
puncture are minute (well-defined in  
*P. parvum*), and the mesopleural punctures are  
more than one diameter apart (less than one  
diameter apart in *P. parvum*). Also similar are  
some males of *Pison tridentatum* in which the  
mandible is bidentate apically (simple in

*P. parvum*), the occipital carina in many specimens is expanded ventrally, higher than the hyposto-  
mal carina (not expanded in *P. parvum*), and the setae of the lower gena are 1.0-1.5  $\times$  as long as  
mid-ocellar diameter (shorter than midocellar diameter in *parvum*).

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart, middle  
supraantennal carina evanescent or absent. Occipital carina joining hypostomal carina. Gena  
narrow in dorsal view (Fig. 773). Labrum not emarginate. Anteromedian pronotal pit transversely  
elongate, less than midocellar diameter. Scutum slightly foveate or not foveate along flange, with-  
out longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than  
one diameter apart or (some specimens) more than one diameter apart near center; interspaces



minutely microsculptured. Scutellum foveate along anterior margin. Tegula enlarged. Mesopleural punctures well defined, less than one diameter apart; interspaces microareolate, dull. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum longitudinally ridged near base, transversally ridged on both sides on median sulcus, remaining surface finely, irregularly rugose; side ridged, punctate between ridges; posterior surface with well-defined, transverse ridges, punctate between ridges. Posteroventral forefemoral surface sparsely punctate basally. Punctures of tergum I mostly less than one diameter apart, some punctures about one diameter apart. Sternum II punctate throughout (apicomedian punctures either well defined or minute).

Setae silvery, subappressed on upper frons, appressed on postocellar area, scutum, and tergum I; completely concealing integument on clypeus (except lamella); on lower gena suberect, straight (curved apically), less than one midocellar diameter. Apical depressions of terga with silvery, setal fasciae.

Body black, hindtarsus ferruginous in some specimens.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.8 \times$  lower interocular distance; ocellocular distance equal to  $0.80\text{--}0.82 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}1.10 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 772). Dorsal length of flagellomere I  $1.7 \times$  apical width, of flagellomere X  $1.0\text{--}1.2 \times$  apical width. Sternum VIII apically rounded, not emarginate (Fig. 774). Genitalia: Figs. 775, 776. Length 4.8–5.3 mm; head width 1.5–1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 777).— Known from one locality in northwestern part of Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: **Western Australia**: 47 km S Pardoo Road House at  $20^{\circ}22.7'S$   $120^{\circ}01.3'E$ , 1–14 May 2003, M.E. Irwin and F.D. Parker (ANIC).

PARATYPE: AUSTRALIA: **Western Australia**: same data as holotype (1 ♂, CAS).



FIGURE 777. Collecting locality of *Pison parvum* Pulawski, sp. nov.

### *Pison pauper* Pulawski, species nova

Figures 778–782.

**NAME DERIVATION.**— *Pauper* is both a Latin noun and adjective meaning *poor*, here used as a noun in apposition; in contrast to *Pison dives* (*rich* in Latin) which this species resembles.

**RECOGNITION.**— *Pison pauper* is an all black species, with three submarginal cells, the setae black on the scutum and erect on tergum I, the mesopleural punctures less than one diameter apart, and only a few, scattered punctures on sterna III and IV mesally. Also, the mandible is simple (posterior margin not step-like, inner margin not tridentate in female and not bidentate in male), and the female gena is punctate and setose on each side of the oral fossa. Two other species are similar, but *P. pauper* differs as follows. Unlike *P. fenestratum*, in which the tergal setae are all silvery, the



FIGURES 778-781. *Pison pauper* Pulawski, sp. nov., female. (778) Clypeus and mandible; (779) Frons; (780) Head in dorsal view; (781) Tegula and adjacent scutum.

apical depressions of its terga have golden setae. Unlike *P. festivum*, the scutum of *P. pauper* has a few longitudinal ridges adjacent to the posterior margin, and the ocellocular distance of the female equals  $1.4 \times$  hindocellar diameter. In *P. festivum* the scutum has no longitudinal ridges adjacent to the posterior margin and the ocellocular distance of the female equals  $1.9-2.2 \times$  hindocellar diameter. The male is unknown.

*P. pauper* also resembles *P. dives* in having abundant, erect, black setae on the upper frons, postocellar area, thorax, and propodeum, but differs in having the following: punctures of frons shallow but well defined, less than one diameter apart on lower frons, on upper frons many punctures more than one diameter apart (Fig. 779); scutal punctures well defined, mostly less than one diameter apart, but many punctures 1-2 diameters apart, interspaces unsculptured, shiny; mesopleural punctures less than one diameter apart; tegular margin evenly rounded; sterna II-IV with widely scattered punctures (punctures large on sternum II, minute on sterna III and IV), and female tergum VI narrow. In *P. dives*, the punctures of the frons are minute, several diameters apart; the scutal punctures are fine, averaging about one diameter apart, the interspaces microsculptured, dull; the mesopleural punctures average about 2-3 diameters apart; the anterior half of the tegular margin is straight or minimally concave, clearly contrasting with rounded posterior half; sterna II-IV are evenly, densely punctate, and female tergum VI is broad.

**DESCRIPTION.**— Frons dull, punctures shallow but well defined, less than one diameter apart on lower frons, on upper frons many punctures more than one diameter apart (Fig. 779). Occipital



carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 780). Labrum not emarginate. Anteromedian pronotal pit slightly transversely elongate, slightly shorter than midocellar diameter. Scutum slightly foveate along flange, with a few longitudinal ridges adjacent to posterior margin; scutal punctures well defined, mostly less than one diameter apart, but many punctures 1-2 diameters apart, interspaces unsculptured, shiny (Fig. 781). Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina evanescent, about half as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, punctate between ridges; side conspicuously ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface with large punctures, most of them less than one diameter apart. Outer surface of hindtibia with minute spines. Tergum I somewhat tumescent medially at base of horizontal part, punctures relatively large, about one diameter apart on each side of tumescence, smaller and denser elsewhere on horizontal part; apical depression markedly below more anterior part of tergum. Sterna II-IV with widely scattered punctures, punctures large on sternum II, minute on sterne III and IV.

Setae black, erect on upper frons, postocellar area, thorax, and propodeum; silvery, erect on tergum I; on gena erect, sinuous, up to two midocellar diameters long; not concealing integument on clypeus. Apical depressions of terga II-V with golden setal fasciae.

Body all black, mandibular apex dark brown.

♀.—Upper interocular distance equal to  $0.78 \times$  lower interocular distance; ocellocular distance equal to  $1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $0.84 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 778). Dorsal length of flagellomere I  $3.6 \times$  apical width, of flagellomere IX  $1.9 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 10.7 mm; head width 2.0 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 782).—Known from one locality in central Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: 3 mi. NNE Mount Madley at  $24^{\circ}29'S$   $123^{\circ}58'E$ , 4 Sept 1971, N.S. Expedition III (WAM).



FIGURE 782. Collecting locality of *Pison pauper* Pulawski, sp. nov.

### *Pison peletieri* Le Guillou

Figures 783-792.

*Pison peletieri* Le Guillou, 1841:324, ♀ (as *Peletieri*, incorrect original capitalization). Lectotype: ♀, northern Australia: no specific locality (MNHN), **present designation**, examined. — Kohl, 1885:188 (in checklist of world *Pison*); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae).

*Pison pelletieri* [sic] Le Guillou, 1842:320, ♀ (as *Pelletieri*, incorrect original capitalization). Objective synonym of *Pison peletieri* Le Guillou, 1841. — Turner, 1916b:597 (in key to Australian *Pison*), 603 (original description copied).

*Pison ruficornis* F. Smith, 1956:315, ♀ (as *ruficornis*, incorrect original termination). Lectotype: ♀, Australia: New South Wales: McIntyre River (BMNH), **present designation**, examined. **New synonym.** — Kohl,

1885:188 (in checklist of world *Pison*); Froggatt, 1892:218 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Turner, 1908:514 (redescription; Australia: Victoria, Queensland: as *ruficornis*), 1916b:596 (in key to Australian *Pison*), 602 (recognition characters, locality records, as *ruficornis*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae). — As *Pisonitus ruficornis*: F. Smith, 1869:298 (new combination, in checklist of *Pisonitus*).

**LECTOTYPE DESIGNATION.**— Neither Le Guillou nor F. Smith mentioned the number of the specimens examined in their original descriptions of *Pison peletieri* and *Pison ruficorne*, respectively. I have designated as the lectotypes of these two species the only existing specimens in the Muséum National d'Histoire Naturelle, Paris, and The Natural History Museum, London, respectively. The two specimens are perfectly conspecific.

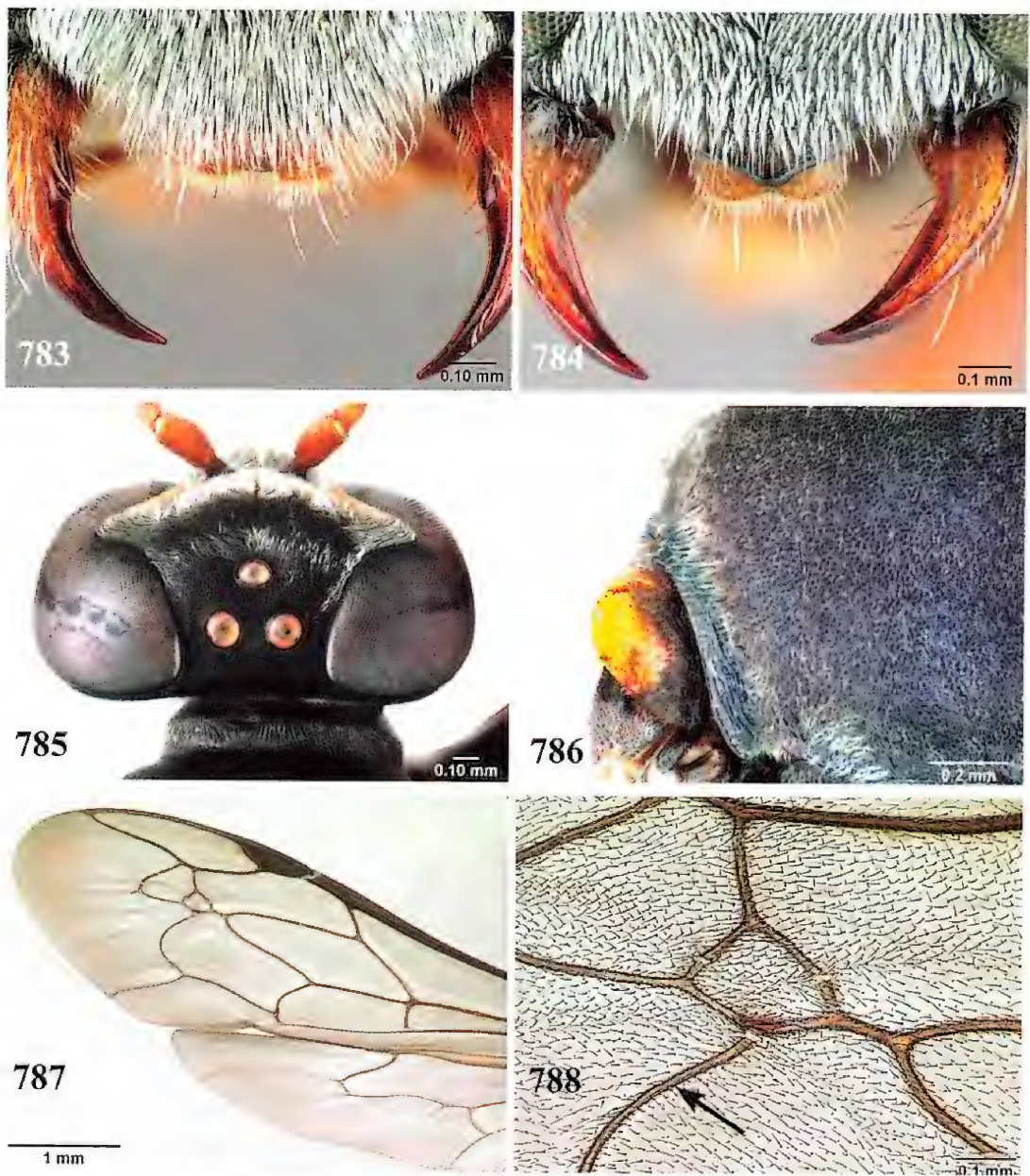
**JUSTIFICATION OF NEW SYNONYMY.**— In his key to the Australian *Pison*, Turner (1916b) erroneously placed *Pison peletieri* in the section of species with the second recurrent vein reaching the second submarginal cell near its apex, and not in the middle of the cell. Apparently he had not seen the type, and was probably misguided by Le Guillou's imperfect statement "Cette espèce se rangera dans la division établie par M. Shuckard pour la Monographie des Pisons", whereas the text would have been correctly "... dans la division des *Pisonitus* établie par M. Shuckard pour la Monographie des Pisons".

**PUBLICATION DATE.**— The volumes containing the descriptions of *Pison peletieri* and *Pison pelletieri* are both dated 1841, but the latter name was demonstrably published after 1 January 1842, as page LXXIV of volume 10 of the *Annales de la Société Entomologique de France* contains a list of "membres reçus depuis le 1<sup>er</sup> Janvier 1842". The only clue to the publication date of the *Revue Zoologique par la Société Cuvierienne* for 1841 are the minutes, on p. 389, of a meeting of 28 December 1841. Although unlikely, it is not impossible that the volume was published in 1841.

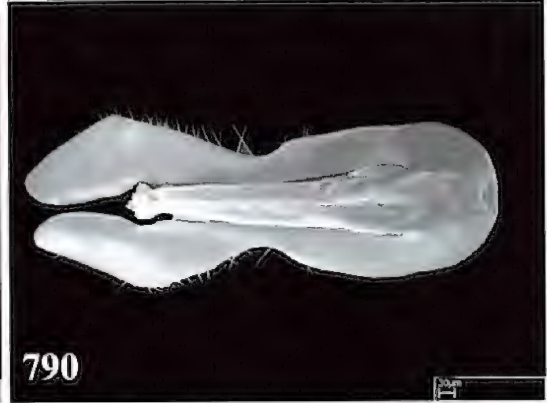
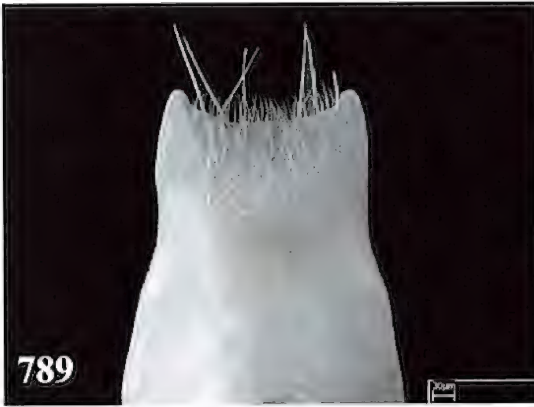
**RECOGNITION.**— *Pison peletieri* is characterized by the second recurrent vein received near the middle of the second submarginal cell, black thorax and propodeum, all or largely ferruginous gaster, and ferruginous tibiae. Unlike *P. virosum*, the distance between the antennal socket and adjacent orbit is equal to the socket width or smaller in *P. peletieri* (rather than about twice socket width), and the scutal flange is slightly projecting beyond the axilla's anterior margin, with the posterior scutal margin slightly concave next to the apex of flange (rather than roundly curving into the anterior margin of the scutellum). Unlike *P. deperditum*, the episcrobal area is not rugose. Unlike *P. orbitale*, the eye emargination of *P. peletieri* is the usual size (rather than less than half midocellar diameter), the tegula is partly impunctate and only partly concealing the humeral plate (rather than all punctate, fully covering the humeral plate), and the thorax lacks the omalus and hypersternaulus (ill defined omalus and hypersternaulus present in *orbitale*). Unlike the female of *P. frontale* (male unknown), the clypeal lobe is well differentiated (rather than not differentiated), and the frons is not swollen (rather than conspicuously swollen). Finally, *P. peletieri* differs from *P. rufigaster* in having finer, microscopically small punctures on the scutum and sternum II, and the free margin of the clypeal lamella truncate or nearly so in the female and in the male either with a median point or acutely to obtusely angulate (in *P. rufigaster*, the scutal and sternal punctures are fine but not microscopic, and the free margin of the clypeal lamella is roundly prominent in the female and roundly arcuate in the male).

**DESCRIPTION.**— Frons dull, minutely punctate, punctures less than one diameter apart. Labrum broadly, shallowly emarginate. Gena narrow in dorsal view (Fig. 785). Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange in most specimens, but foveolate in those from Western Australia and Papua New Guinea, not ridged





FIGURES 783-788. *Pison peletieri* Le Guillou. (783) Female clypeus and mandibles; (784) Male clypeus and mandibles; (785) Female head in dorsal view; (786) Female tegula and adjacent scutum; (787) Left forewings; (788) Center of left forewing (arrow shows second recurrent vein).



FIGURES 789-791. *Pison peletieri* Le Guillou, male. (789) Sternum VIII (ventral surface); (790) Genitalia in dorsal view; (791) Genitalia in lateral view.

or with evanescent longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart (Fig. 786). Punctures of mesopleuron slightly larger than those on scutum, less than one diameter apart. Tegula slightly elongate. Postspiracular carina present, about half as long to about as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus well defined between dorsal and ventral metapleural pits, not costulate. Propodeum with irregular longitudinal carina separating side from dorsum and posterior face and extending from gastral socket area toward spiracle, with conspicuous transverse ridges emerging from carina on both inner and outer side; dorsum obliquely ridged; in some specimens with second, more median carina that is interrupted by ridges; side punctate or ridged (punctate between ridges); posterior surface ridged; all propodeal ridges markedly varying from fine to conspicuous. Second recurrent vein ending at middle of submarginal cell II (Figs. 787, 788). Posteroventral forefemoral surface microscopically, closely punctate. Punctures of tergum I microscopically fine, averaging less than one diameter apart. Sternum II minutely, sparsely punctate, impunctate apicomeresally.

Setae silvery (with golden tinge on clypeus in some specimens), appressed on gena, thorax, and forecoxal venter, on upper frons (between midfrontal carina and midocellus) suberect, oriented dorsally, shorter than midocellar diameter; nearly completely concealing integument on clypeus; not forming setal fasciae on apical depressions of terga.

Head, thorax, propodeum, and femora black (femora ferruginous in lectotype, partly so in specimens from Papua New Guinea), female clypeus ferruginous next to lobe free margin; mandible black basally, yellowish brown subbasally, ferruginous subapically, dark apically; antenna ferruginous (scape, pedicel, and apical flagellomeres dark dorsally in most specimens, apical flagellomere all dark in some specimens); tibiae, tarsi, and gaster reddish brown (tergum I nearly all black in lectotype and some other specimens).

♀.—Upper interocular distance equal to  $0.80-0.86 \times$  lower interocular distance; ocellocular distance equal to  $0.5-0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.0 \times$



hindocellar diameter; eye height equal to  $1.04-1.08 \times$  distance between eye notches. Free margin of clypeal lamella truncate or with small, round median point (Fig. 783). Dorsal length of flagellomere I  $2.3-2.5 \times$  apical width ( $2.9 \times$  in lectotype of *peletieri*), of flagellomere IX  $1.1-1.2 \times$  apical width. Mandible: trimmal carina with small notch at about one third of length. Length 6.2-7.7 mm; head width 1.8-2.1 mm

♂.—Upper interocular distance equal to  $0.83-1.00 \times$  lower interocular distance, ocellular distance equal to  $0.6-0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2 \times$  hindocellar diameter; eye height equal to  $1.06-1.13 \times$  distance between eye notches. Free margin of clypeal lamella obtusely to acutely angulate or with median point (Fig. 784). Dorsal length of flagellomere I  $1.7 \times$  apical width, of flagellomere X  $1.0-1.9 \times$  apical width. Sternum VIII shallowly, broadly emarginate (Fig. 789). Genitalia: Figs. 790, 791. Length 5.3-5.6 mm; head width 1.5-1.8 mm.

**VARIATION.**—In a specimen from Agnes Water, Queensland, the second submarginal cell is open in the ventral half on the distant side in the right wing, and totally reduced in the left wing (except for a minimal stub on the first intersubmarginal cell).

**GEOGRAPHIC DISTRIBUTION** (Fig. 792).—

Australia except Tasmania, Papua New Guinea.

**RECORDS.**—AUSTRALIA: Australian Capital

**Territory:** Black Mountain at  $35^{\circ}16'S$   $149^{\circ}06'E$  (1 ♀, CAS; 2 ♀, 1 ♂, UCD), Canberra (7 ♀, ANIC), Farrer (southern suburb of Canberra) at  $35^{\circ}22'S$   $149^{\circ}05'E$  (1 ♀, 2 ♂, ANIC). **New South Wales:** Burrendong Botanic Garden at  $32^{\circ}42.1'S$   $149^{\circ}06.2'E$  (1 ♀, CAS), Cairncross State Forest 15 km N Wauchope (1 ♀, AMS), Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (11 ♀, CAS), Doyles River State Forest 50 km NW Taree at  $31^{\circ}31'S$   $152^{\circ}14'E$  (5 ♀, AMS), 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (1 ♀, CAS), Fairfield (1 ♀, BMNH), Gibraltar Range National Park (1 ♂, AMS), Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$  (1 ♀, CAS), Limeburners Creek Nature Reserve at  $31^{\circ}18'S$   $153^{\circ}52'E$  (1 ♀, AMS), Lord Howe Island at  $31^{\circ}31'37"S$   $159^{\circ}03'58"E$  (1 ♀, AMS), Lorient Wildlife Refuge 3 km N Lansdowne near Taree (3 ♀, 1 ♂, AMS), Maria National Park 12 km S Kempsey (1 ♀, AMS), McIntyre River (1 ♀, BMNH, lectotype of *Pison ruficornis* F. Smith, 1856), 10 km W Murwillumbah (1 ♀, AMS), Myall Lakes National Park: Mungo Bush (1 ♀, AMS), 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$  (1 ♀, CAS), Orange Botanic Gardens at  $33^{\circ}15.3'S$   $149^{\circ}05.7'E$  (2 ♀, CAS), Pilliga Nature Reserve at  $31^{\circ}02.6'S$   $149^{\circ}19.0'E$  (1 ♀, CAS), Rosebank (1 ♀, AMS), Sydney (1 ♀, AMS), Sydney: Elizabeth Bay (1 ♀, AMS), 15 km NE Ulan (1 ♀, ANIC), Warrensburg National Park (2 ♂, UCD), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (2 ♀, CAS), near Warrumbungle National Park at  $31^{\circ}16.9'S$   $149^{\circ}04.8'E$  (5 ♀, CAS), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (1 ♀, CAS), 10 km N Woolli at  $29^{\circ}48'S$   $153^{\circ}12'E$  (1 ♀, AMS). **Northern Territory:** Berry Springs Park 50 km S Darwin (1 ♂, NTM), Darwin (1 ♀, NTM), Gregory National Park at  $16^{\circ}03.7'S$   $130^{\circ}27.1'E$  (1 ♀, CAS), Koolpin Gorge in Kakadu National Park (2 ♂, AMS), Larrakeyah at  $12^{\circ}28'S$   $130^{\circ}50'E$  (1 ♀, 2 ♂, ANIC). **Queensland:** Agnes Water 40 km E Miriam Vale (3 ♀, AMS), Almaden (2 ♀, AMS), Arcadia on Magnetic Island at  $19^{\circ}09'S$   $146^{\circ}52'E$  (5 ♀, 1 ♂, ANIC), Atherton at  $17^{\circ}17'S$   $145^{\circ}29'E$  (3 ♀, 1 ♂, ANIC), 20 mi. NW Ayr (1 ♀, CAS), Ball Bay near Hillsborough (1 ♀, AMS), 4 km NE Batavia at  $12^{\circ}39'S$   $142^{\circ}42'E$  (1 ♀, ANIC), 7 km S Batavia at  $12^{\circ}43'S$   $142^{\circ}42'E$  (1 ♀, ANIC), Bluff Range via Biggenden (1 ♂, ANIC), Brisbane (1 ♀, AMNH; 1 ♂, ANIC; 4 ♀, 2 ♂, QMB), Brisbane: Bardon (1 ♀, BMNH), Brisbane: Blunder Creek (1 ♀, QMB), Brisbane Forest Park (1 ♀, MNKB), Brisbane: Karawatha Forest at  $27^{\circ}38.6'S$   $153^{\circ}04.2'E$  (2 ♀, CAS), Brisbane:



FIGURE 792. Collecting localities of *Pison peletieri* Le Guillou.

Mount Coot-tha (3 ♀, CAS), Cairns (1 ♀, AMS), Cairns District (1 ♀, AMS), Cape York: no specific locality (1 ♀, AMS), Carnarvon National Park at 25°04.0'S 148°14.7'E (2 ♀, 1 ♂, CAS), Coen at 13°57'S 143°12'E (1 ♀, ANIC), Coast Range 17 km S Biggenden (1 ♀, ANIC), Crediton State Forest at 21°11.8'S 148°29.9'E (2 ♀, CAS), Curtain Fig 2 km SSW Yungaburra at 17°17'S 145°34'E (1 ♀, ANIC), Davies Creek National Park at 17°00.2'S 145°34.1'E (1 ♀, CAS), 9 km S Dingo Beach at 20°05.5'S 148°30.2'E (1 ♂, CAS), Dipperu National Park at 21°53.9'S 148°46.5'E (1 ♀, CAS), Dunwitch on North Stradbroke Island (1 ♀, QMB), Eungella National Park at 21°10.5'S 148°30.3'E (35 ♀, 4 ♂, CAS; 1 ♀, QMB), Farm Creek (1 ♀, QMB), Fletcher Creek 43 km NW Charters Towers at 19°48.9'S 146°03.3'E (3 ♀, CAS), Gunshot Creek at 11°45'S 142°28'E (6 ♀, ANIC), Hann River at 15°11'S 143°52'E (2 ♀, ANIC), Heathlands at 11°43'S 142°35'E (1 ♀, ANIC) and 11°45'S 142°35'E (1 ♀, 1 ♂, ANIC), 14 km ENE Heathlands at 11°41'S 142°42'E (2 ♀, ANIC), 12 km SSE Heathlands at 11°51'S 142°38'E (4 ♀, 1 ♂, ANIC), Herberton (1 ♀, BMNH), Hogback Range 44 mi. WSW Bundaberg (1 ♂, ANIC), Kuranda: Russet Park (1 ♀, 1 ♂, CAS), Lamington National Park at 28.210°S 153.139°E (5 ♀, 1 ♂, QMB), 28.142°S 153.133°E (8 ♀, QMB), and 28.151°S 153.138°E (3 ♀, 6 ♂, QMB), Mackay (6 ♀, BMNH), Malanda (1 ♀, CAS), 65 km N Marlborough (1 ♂, AMS), Maryborough at 25°32'S 152°44'E (2 ♀, 4 ♂, ANIC), Mornish, Louisa Creek (1 ♀, CAS), 48 km E Mount Surprise at 18°09.0'S 144°43.6'E (15 ♀, CAS), Mount Walsh National Park near Biggenden (1 ♀, 1 ♂, ANIC), Mungumby Lodge near Helenvale (2 ♀, AMS), Noosa: Sandstone beach (1 ♀, CAS), Quintel Beach (1 ♀, AMS), 18 km S Ravenshoe (1 ♀, AMS), 2 km N Rokeby at 13°39'S 142°40'E (4 ♀, ANIC), Split Rock 14 km SE Laura at 15°39'S 144°31'E (4 ♀, 5 ♂, ANIC), ca 15 mi N Townsville (1 ♂, QMB), 13 km SE Weipa at 12°40'S 143°00'E (2 ♀, 1 ♂, ANIC), Whitsunday Islands (2 ♀, RMNH), Woodgate 35 km E Childers (1 ♀, AMS), Wynnum (1 ♀, QMB). **South Australia:** Belair National Park (1 ♀, SAM), Eden Hills near Adelaide (1 ♀, SAM), Micham near Adelaide (2 ♀, SAM), Mount Lofty (1 ♀, SAM), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (2 ♀, CAS), 3 km ENE Wilpena at 31°31.0'E 138°36.6'E (1 ♀, CAS). **Western Australia:** Carson escarpment at 14°49'S 126°49'E (1 ♀, ANIC), 10 km W Cobra Station at 24°10.2'S 116°23.0'E (1 ♀, ANIC), Cottesloe [a western suburb of Perth] (1 ♀, WAM), Eneabba (1 ♀, WAM), Nedlands [a western suburb of Perth] (1 ♀, WAM), Perth at 31°57'S 115°51'E (1 ♀, WAM). **No specific locality:** 1 ♀, MNHN, lectotype of *Pison peletieri*.

**PAPUA NEW GUINEA:** **Morobe District:** Bulolo (1 ♀, BISH), Wau (4 ♀, 1 ♂, BISH). **National Capital District:** Port Moresby (2 ♂, CAS).

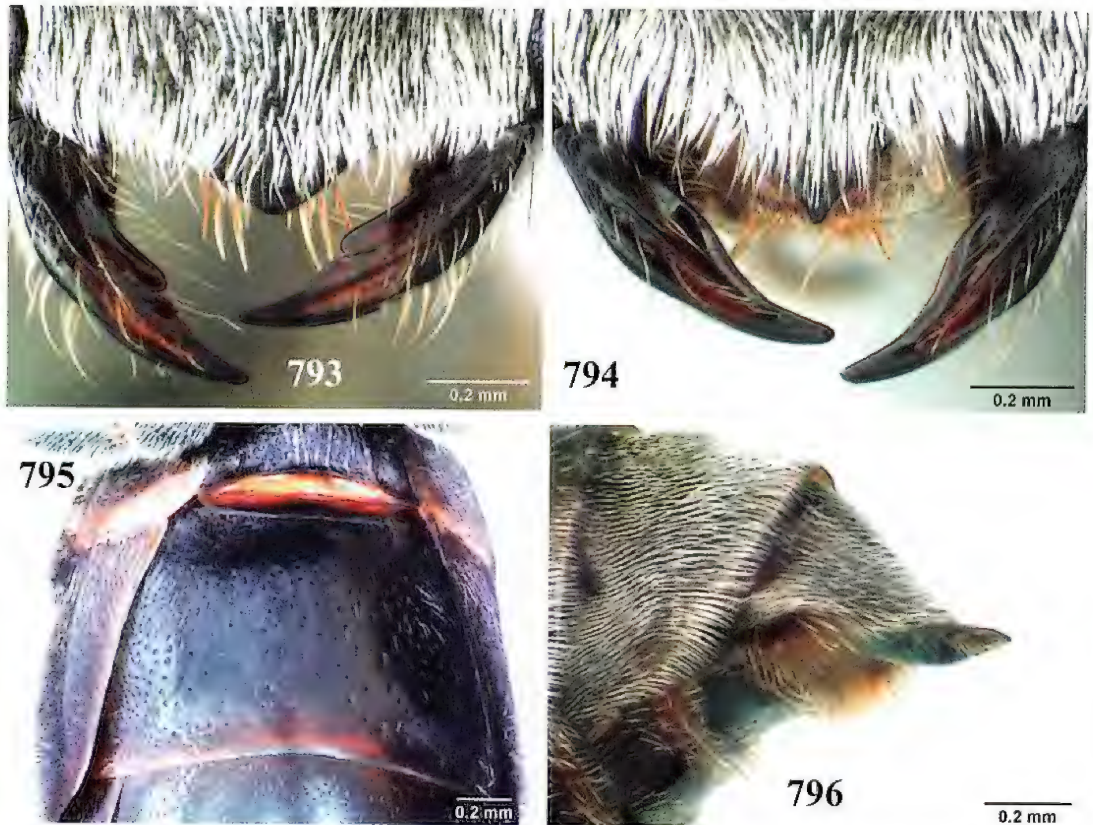
### *Pison penicillatum* Pulawski, species nova

Figures 793-801.

**NAME DERIVATION.**—*Penicillatum* is a Latin neuter adjective derived from *penicillum*, or *paintbrush*, with reference to the setal brushes on male gastral segment VII.

**RECOGNITION.**—*Pison penicillatum* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. In both sexes, the sterna are sparsely punctate: sternum II basomedially has large punctures that are several to many diameters apart (except densely punctate at the very base), and it is impunctate apicomically (Fig. 795); the following sterna are practically impunctate mesally. In the female, the clypeal lamella is obtusely angulate (Fig. 793). In the male, sternum VII, and to a lesser degree tergum VII, have a tuft of dense, erect setae posterolaterally (Fig. 796), and sternum VIII is not emarginate apically, a character combination similar to that of *P. naralte* (in which, however, the erect setae are present on the apicolateral corners of sterna IV and V). *Pison penicillatum* differs in having the setae of the upper frons about as long as the midocellar diameter (about as long as  $0.5 \times$  midocellar diameter in *P. naralte*), those on the scutum in most specimens sparse, erect, at least as long as one midocellar diameter (rather than appressed), and those on the lower gena are  $1.5\text{--}2.0 \times$  as long as the midocellar diameter (shorter than midocellar diameter in *P. naralte*). Also, sternum II is impunctate along the midline or has a few sparse punctures (except basally), sternum V has no apical sulcus, erect setae of sternum VII are as long as midocellar diameter,

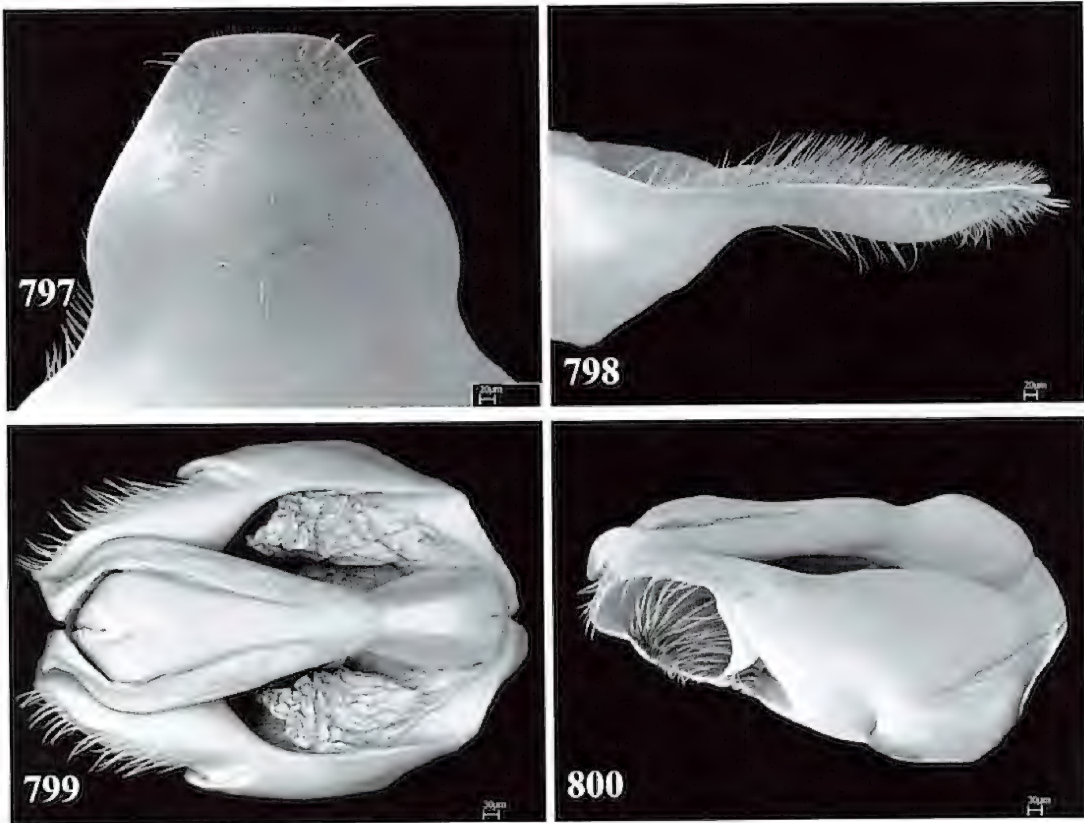




FIGURES 793-796. *Pison penicillatum* Pulawski, sp. nov. (793) Female clypeus and mandibles; (794) Male clypeus and mandibles; (795) Female sternum II; (796) Apex of male gaster in lateral view.

and sternum VIII has an obtuse longitudinal swelling (Fig. 797), whereas in *P. naralte* sternum II is closely punctate except impunctate on the apical depression, sternum V has a well defined median sulcus on the apical depression, erect setae of sternum V are twice as long as midocellar diameter, and sternum VIII has no longitudinal swelling.

**DESCRIPTION.**—Frons with well-defined punctures that are less than one diameter apart; interspaces conspicuously microsculptured. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures conspicuous, averaging about one diameter apart on disk; interspaces microsculptured, dull. Tegula enlarged. Mesopleural punctures well defined, compressed against each other. Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly obliquely ridged, punctate between ridges; side with well-defined punctures, with interspaces merging into irregular ridges; posterior surface conspicuously, transversally ridged. Second submarginal cell small: its height equal to  $0.5-0.6 \times$  the distance between its tip and the marginal cell. Posteroventral forefemoral surface closely punctate, punctures small but not microscopic. Punctures of tergum I, on horizontal part, averaging more than one diameter apart. Sternum II basomedially with large punctures that are several to many diameters apart (except densely punctate at



FIGURES 797-800. *Pison penicillatum* Pulawski, sp. nov., male. (797) Sternum VIII (ventral surface); (798) Sternum VIII in lateral view; (799) Genitalia in dorsal view; (800) Genitalia in lateral view.

very base), impunctate apicomesally (Fig. 795); following sterna practically impunctate mesally.

Setae silvery, both appressed and erect on frons (appressed setae oriented ventral, erect setae as long as midocellar diameter), on scutum short, suberect, dense, and in most specimens long, sparse (long setae equal to midocellar diameter), appressed on tergum I; setae of lower gena sinuous,  $1.5-2 \times$  as long as midocellar diameter; largely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, legs, and gaster black, mandible dark ferruginous preapically.

♀.— Upper interocular distance equal to  $0.72-0.74 \times$  lower interocular distance; ocellocular distance equal to  $1.0-1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3-1.4 \times$  hindocellar diameter; eye height equal to  $0.86-0.88 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 793). Dorsal length of flagellomere I  $2.1-2.2 \times$  apical width, of flagellomere IX  $1.0-1.1 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 7.2-7.9 mm; head width 2.2-2.5 mm.

♂.— Upper interocular distance equal to  $0.84-0.88 \times$  lower interocular distance; ocellocular distance equal to  $1.1-1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.3 \times$  hindocellar diameter; eye height equal to  $0.86 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 794). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $0.9 \times$  apical width. Tergum VII and sternum VII posterolaterally with tuft of dense, erect setae (Fig. 796), setae of sternum VII as long as midocellar diameter. Sternum VIII rounded



apically (Fig. 797), with obtuse, longitudinal swelling, in lateral view: Fig. 798. Genitalia: Figs. 799, 800. Length 6.7–8.2 mm; head width 1.9–2.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 801).— New South Wales, Northern Territory, Queensland, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA:** **New South Wales:** Crowdy Bay National Park, 19–21 Nov 1979, N.W. Rodd (AMS).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Adelaide River at 13°14'S 131°06'E (1 ♂, NTM); near Finnis River at 12°57'S 130°33'E, 21–27 Apr 1998, M. Hoskins (1 ♀, NTM); Gregory National Park at 15°58.3'S 130°29.3'E, 6–9 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS), at 16°6.4'S 130°25.4'E, 4–12 June 2001, F.D. Parker, M.E. Irwin, and C. Lambkin (1 ♂, ANIC), at 16°06'42"S 130°25'23"E, 24 May – 5 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS), at 16°06'47"S 130°25'24"E, 24 May – 4 June 2001, M.E. Irwin and F.D. Parker (1 ♂, CAS), and 16°07'55"S 130°26'11"E, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, ANIC); Gregory National Park near Timber Creek on Victoria River bank at 15°37.8'S 130°28.6'E, 10 Apr 2008, W.J. Pulawski and G.A. Williams (1 ♀, CAS); Jabiru, 5–9 June 1984, I.D. Naumann (1 ♀, 2 ♂, ANIC); Keep River National Park at 15°45.4'S 129°5.6'E, 8 June 2001, F.D. Parker and M.E. Irwin (3 ♂, CAS), at 15°45'44"S 129°05'55"E, M.E. Irwin and F.D. Parker, 8 June 2001 (2 ♂, CAS) and 10–20 June 2001 (1 ♂, CAS), at 15°45'30"S 129°06'28"E, 14 May – 20 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS) and 3–17 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, 1 ♂, ANIC), at 15°45'42"S 129°06'45"E, 7–10 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS), at 15°45'44"S 129°05'55"E, F.D. Parker and M.E. Irwin, 14 May – 20 June 2001 (1 ♀, CAS) and 9 June 2001 (3 ♀, ANIC), at 15°47'49"S 129°06'31"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 3–6 June 2001 (1 ♀, 2 ♂, CAS), 6–8 June 2001 (1 ♂, ANIC), and 7 June 2001 (2 ♀, CAS), at 15°57'33"S 129°01'44"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 14 May – 20 June 2001 (1 ♀, ANIC), 3–8 June 2001 (2 ♀, CAS), at 15°57'55"S 129°01'52"E, 14 May – 20 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC), at 15°57'59"S 129°01'47"E, 3 June 2001, F.D. Parker (1 ♀, ANIC), at 15°57'55"S 129°01'52"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 10–13 June 2001 (1 ♂, ANIC), and 13–20 June 2001 (1 ♀, CAS), at 15°58'19"S 129°02'18"E, 3 June 2001, F.D. Parker and M.E. Irwin (3 ♀, CAS); Mango Plantation, M. Hoskins, at 12°47'S 130°57'E, 12 Apr 1997 (3 ♀, NTM) and at 12°52'S 130°35'E, 18 Jul 1997 (3 ♀, 1 ♂, NTM); 16 km NE Mount Cahill at 12°50'S 132°51'E, 23 May 1973, T. Weir and T. Angeles (1 ♀, NTM); Nourlangie Creek 6 km E Mount Cahill at 12°52'S 132°46'E, 18 Nov 1972, J.C. Cardale (1 ♂, ANIC); Victoria Highway 38.5 km SW Timber Creek at 15°42'40"S 130°07'48"E, 6–13 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC; 2 ♀, CAS); Virginia 31 km SE Darwin Central Business District at 12°33'S 131°02'E, 7 Sept 1997, S.M. Gregg (1 ♂, NTM). **Queensland:** Heathlands at 11°45'S 142°35'E, 21 Oct – 22 Nov 1992, P. Zborowski and A. Calder (1 ♀, ANIC); Keppel Sands at 23°19.5'S 150°47.6'E, 28 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Western Australia:** Carson escarpment at 14°49'S 126°49'E, 9–15 Aug 1975, I.F.B. Common and M.S. Upton (1 ♂, ANIC); Drysdale River at 15°02'S 126°55'E, 3–8 Aug 1975, I.F.B. Common and M.S. Upton (1 ♀, ANIC); Kalumburu Mission, 15 Sept 1985, Anne and Les Dollin (1 ♀, ANIC); Mining Camp in Mitchell Plateau at 14°49'S 125°50'E, 9–19 May 1983, I.D. Naumann and J.C. Cardale (3 ♀, 1 ♂, ANIC) and at 14°52'S 125°50'E, 2–6 June 1988, I.D. Naumann (1 ♂, ANIC); 4 km SW Mining Camp in Mitchell Plateau at 14°52'S 125°50'E, 2–6 June 1988, I.D. Naumann (1 ♀, ANIC).



Figure 801. Collecting localities of *Pison penicillatum* Pulawski, sp. nov.

*Pison perplexum* F. Smith

Figures 802-810.

*Pison perplexum* F. Smith, 1956:314, ♂ (as *perplexus*, incorrect original termination). Lectotype: ♂, North Australia: no specific locality (BMNH), **present designation**, examined. – F. Smith, 1869:290 (in checklist of *Pison*, as *perplexus*); Kohl, 1885:188 (in checklist of world *Pison*); *nec* Roth, 1885:321 (= *Pison argentatum*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Turner, 1910:355 (description of ♀, as *perplexus*), 1916b:597 (in key to Australian *Pison*), 605 (may be the male of *Pison fuscipenne*, as *perplexus*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae).

*Pison fuscipenne* F. Smith, 1869:294, ♀ (as *fuscipennis*, incorrect original termination). Lectotype: ♀, Australia: Western Australia: Champion Bay, now Geraldton, but labeled "Swan r." (BMNH), **present designation**, examined. **New synonym.** – Kohl, 1885:187 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Turner, 1916b:597 (in key to Australian *Pison*), 606 (recognition characters); *nec* Yasumatsu, 1937:131 and 1939b:83 (= *Pison hospes*); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Cardale, 1985:259 (in catalog of Australian Sphecidae).

*Pison punctulatum* Kohl, 1884:336, ♀, ♂. Lectotype: ♀, Australia: Queensland: Peak Downs (NHMW), **present designation**, examined. **New synonym.** – Kohl, 1885:188 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Vachal, 1907:114 (New Caledonia, determination tentative); Turner, 1908:512 (Australia: Queensland: Mackay and Peak Downs); W. Schulz, 1911b:198 (New South Wales, variation); Turner, 1916b:597 (in key to Australian *Pison*), 608 (recognition characters); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae); Dollfuss, 1989:11 (type material in NHMW).

**LECTOTYPE DESIGNATION AND TYPE LOCALITY.**– Smith (1856) did not give the number of specimens examined in his description of *Pison perplexum*. I have selected as the lectotype the only specimen under this name in The Natural History Museum, London. Although the description only gives Australia as the country of origin, the specimen is labeled "N. Australia".

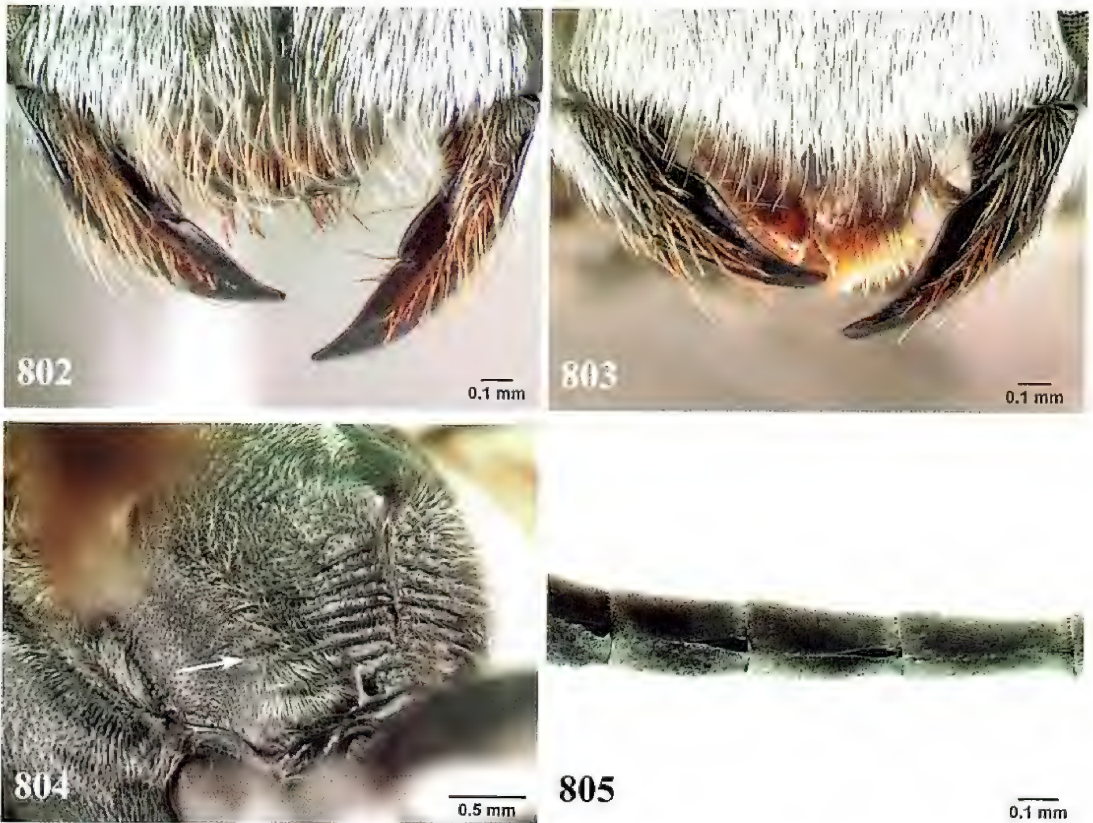
Likewise, he (1869) did not mention the number of the specimens examined in the original description of *Pison fuscipenne*, and I have designated as the lectotype the only existing specimen in The Natural History Museum, London. It is said, in the description, to have originated from Champion Bay (now Geraldton), but it is labelled "Swan r.", probably Swan River.

I have examined the two syntypes of *Pison punctulatum* present in the Naturhistorisches Museum, Wien and designated the female as the lectotype of this species and the male as the paralectotype.

**JUSTIFICATION OF NEW SYNONYMY.**– The lectotype of *P. perplexum* is clearly the opposite sex of that of *P. fuscipenne*. Turner (1916b) already suspected this synonymy, but was hesitant to accept it because of the limited number of the specimens available to him. Also the two syntypes of *P. punctulatum* are clearly conspecific with *P. perplexum*, the two names thus being synonyms.

**RECOGNITION.**– *Pison perplexum* is an all black species with three submarginal cells, the second recurrent vein joining the second submarginal cell near its apex or interstitial with the second intersubmarginal vein, the setae appressed on tergum I, and conspicuous silvery, setal fasciae on the apical depressions of terga. It can be recognized by the transverse ridges of the posterior propodeal surface that extend onto the propodeal side (Fig. 804); there is either no carina delimiting dorsum and posterior surface from the side or, if exceptionally the carina is present, it does not extend to the bottom of the propodeum. Subsidiary recognition features are: dorsum of pronotal collar with dense appressed setae that totally conceal the integument (except in the middle); many scutal punctures in most specimens more than one diameter apart (many up to two

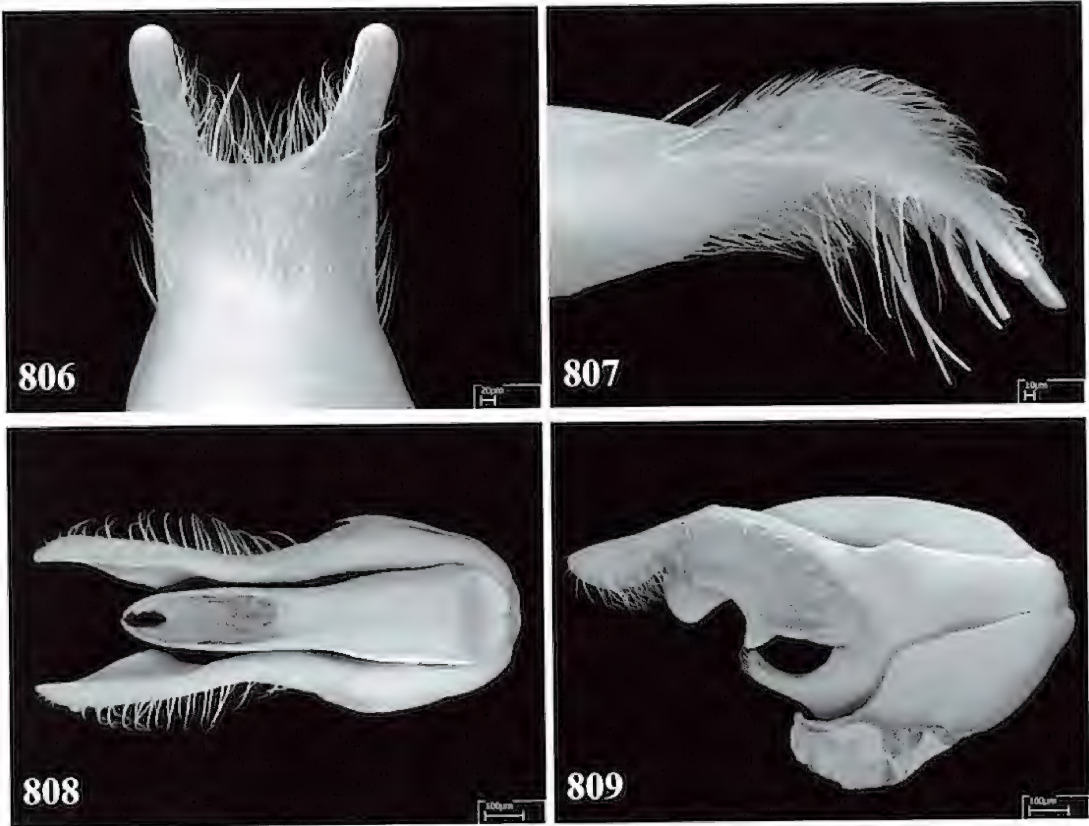




FIGURES 802-805. *Pison perplexum* F. Smith. (802) Female clypeus and mandibles; (803) Male clypeus of mandibles; (804) Female propodeum in oblique lateral view (arrows shows transverse ridges transgressing onto lateral side); (805) Male flagellomeres II-IV and half V showing tyloids.

or three diameters apart); clypeus in most females shallowly concave just above lamella which has a well-defined lateral corner; ocellular distance in female equal to  $0.7-0.9 \times$  hindocellar diameter; male sternum VIII unusually deeply emarginate (Fig. 806), with apicolateral arm conspicuously curved ventrally (Fig. 807), and male flagellomeres II-V with linear tyloids ventrally (Fig. 805). Sternum VIII is also unusually deeply emarginate in the males of *P. excisum* and *P. petraeum*, which differ from *P. perplexum* by a number of characters (see these species for the differences).

**DESCRIPTION.**—Frons dull, punctate, punctures less than one diameter apart. Occipital carina somewhat expanded, joining hypostomal carina. Labrum not emarginate or minutely emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Propleuron impunctate anteromesally. Scutum at most finely foveate along flange (not foveate in most specimens), without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, many of them in most specimens more than one diameter apart (some up to two or three diameters apart); interspaces aciculate. Mesopleural punctures well defined, less than one diameter apart anteriorly, up to two diameters apart posteriorly in some specimens; interspaces aciculate. Postspiracular carina present or absent (when present, up to about  $1.5 \times$  midocellar diameter long). Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum, in most specimens, without carina separating side from dorsum and posterior surface, but such carina present in some; dorsum obliquely ridged (ridges conspicuous anterolaterally or laterally), punctate between ridges; side with compressed punctures, interspaces merging into irregular ridges; poste-



FIGURES 806-809. *Pison perplexum* F. Smith, male. (806) Sternum VIII (ventral surface); (807) Sternum VIII in oblique lateral view; (808) Genitalia in dorsal view; (809) Genitalia in lateral view.

rior surface conspicuously ridged, ridges extending into posterior part of propodeal side (Fig. 804). Punctures of tergum I well defined, about one diameter apart mesally. Sternum II punctate throughout.

Setae silvery, mainly appressed (including tergum I), but suberect on upper frons (about as long as  $0.5 \times$  midocellar diameter) and on lower gena (about as long as midocellar diameter), forming setal fasciae on apical depressions of terga.

Head (including antenna and mandible), thorax, propodeum, legs, and gaster black.

♀.— Upper interocular distance equal to  $0.6 \times$  lower interocular distance; ocellocular distance equal to  $0.7\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate, with obtuse but well-defined lateral corner (Fig. 802), clypeal surface in most specimens shallowly concave dorsally of lamella. Dorsal length of flagellomere I  $3.3 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision shortly after midlength, acetabular groove with two rows of punctures and associated setae. Length 11.8–12.7 mm; head width 3.2–3.4 mm.

♂.— Upper interocular distance equal to  $0.80 \times$  lower interocular distance; ocellocular distance equal to  $1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $0.88 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 803). Dorsal length of flagellomere I  $3.3 \times$  apical width, of flagellomere X  $1.3 \times$



apical width; flagellomeres III and IV concave basoventrally, convex apicoventrally (slightly to conspicuously so), II-V with linear tyloids ventrally (Fig. 805). Sternum VIII broadly, deeply emarginate (Fig. 806), apicolateral arm conspicuously bent ventrally (Fig. 807). Genitalia: Figs. 808, 809. Length 8.5-9.6 mm; head width 2.5-2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 810).—Whole Australia except Tasmania and Victoria.

**RECORDS.**— **AUSTRALIA:** **New South Wales:** 17 km NE Broken Hill at 31°47'S 141°31'E (1 ♀, AMNH), Fowlers Gap Research Station at 31°05'S 141°42'E (1 ♀, AMNH; 1 ♀, ANIC), Gilgandra (1 ♀, AMS), Orange Botanic Gardens at 33°15.3'S 149°05.7'E (2 ♂, CAS), Warrumbungle National Park at 31°16.9'S 148°59.1'E (1 ♂, CAS), 87 km E Wilcannia at 31°42.8'S 144°08.6'E (3 ♀, 2 ♂, CAS), Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E (2 ♀, 2 ♂, CAS). **Northern Territory:** 27 km NW Alice Springs at 23°27'S 133°50'E (1 ♀, ANIC), Devils Marbles 9 km NNE Wauchope at 20°34'S 134°16'E (1 ♂, ANIC), Ellery Gorge 85 km W Alice Springs at 23°46'S 133°04'E (5 ♂, ANIC), Todd River 8 mi. N Alice Springs (1 ♂, ANIC). **Queensland:** Almaden (3 ♀, AMS), Amby (2 ♀, 1 ♂, QMB), Condamine (1 ♂, AMS), Cunnamulla (1 ♀, AMS), Murrays Spring 8 km NW Musselbrook at 18°35'S 138°03'E (1 ♂, ANIC), Musselbrook Camp at 18°36'S 138°08'E (1 ♀, ANIC), Musselbrook Reserve (2 ♀, NTM), Peak Downs (1 ♀, 1 ♂, NHMW, lectotype and paralectotype of *Pison punctulatum*), Tara (1 ♀, QMB), Wondai (1 ♀, QMB). **South Australia:** Adelaide (1 ♀, RMNH), Victory Well in Everard Park Station at 27°S 132.7°E (1 ♂, SAM), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (9 ♀, 20 ♂, CAS), 3 km ENE Wilpena at 31°31.0'S 138°36.6'E (56 ♀, 25 ♂, CAS), 34 km S Wilpena (1 ♀, 2 ♂, UCD). **Western Australia:** Badgingarra at 30°23'56"S 115°33'14" (1 ♀, WAM), Balgo Hills (2 ♀, ANIC), Bamboo Creek at 20°55'S 120°13'E (6 ♀, WAM), Chidlow at 31°52'S, 116°16'E (2 ♀, WAM), 10 km W Cobra Station at 24°10.2'S 116°23'E (1 ♀, ANIC; 1 ♀, 1 ♂, CAS), Geraldton (as Champion Bay), (1 ♀, lectotype of *Pison fuscipenne*, labeled Swan r.), Juna Downs Station at 22°51'36"S 118°42'19"E (4 ♂, AMS), 11 mi. SE Kalbarri (1 ♀, WAM), 82 km S junction Karijini Drive on Great Northern Highway at 23°07.3'S 119°05.5'E (1 ♀, USU), Karijini National Park at 22°26.3'S 118°22.9'E (1 ♀, CAS), Kathleen Valley at 27°24'S 120°39'E (2 ♀, WAM), Minnivale at 31°08'S 117°11'E (1 ♀, WAM), Morawa at 29.208270°S 116.007602°E (1 ♀, MNKB), Mount Augustus National Park at 24°18.0'S 116°47.6'E (2 ♀, ANIC) and 24°21.7'S 116°50.2'E (1 ♂, CAS), Nullagine at 21°53'S 120°07'E (2 ♀, WAM), Perth: Darlington (2 ♀, WAM), Pigeon Rocks at 29°55'S 119°16'E (16 ♀, WAM), Southern Cross at 31°13'S 119°20'E (1 ♂, WAM), Turner Creek 24 km W Mulga junction, 121 km W Highway 95 at 24°50.7'S 118°28.9'E (1 ♀, ANIC). **No specific locality:** (1 ♀, BMNH, lectotype of *Pison perplexum*).



FIGURE 810. Collecting localities of *Pison perplexum* F. Smith.

### *Pison pertinax* Turner

Figures 811-819.

*Pison pertinax* Turner, 1908:517, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. — Turner, 1916b:595 (in key to Australian *Pison*), 599 (coloration, locality records); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— In his original description of *P. pertinax*, Turner (1908) indicated more than one specimen examined ("January to May"), but did not indicate their exact number. Of the eight specimens present in The Natural History, London, I have labeled one as the lectotype and the remaining seven as paralectotypes.



811



812



813



814



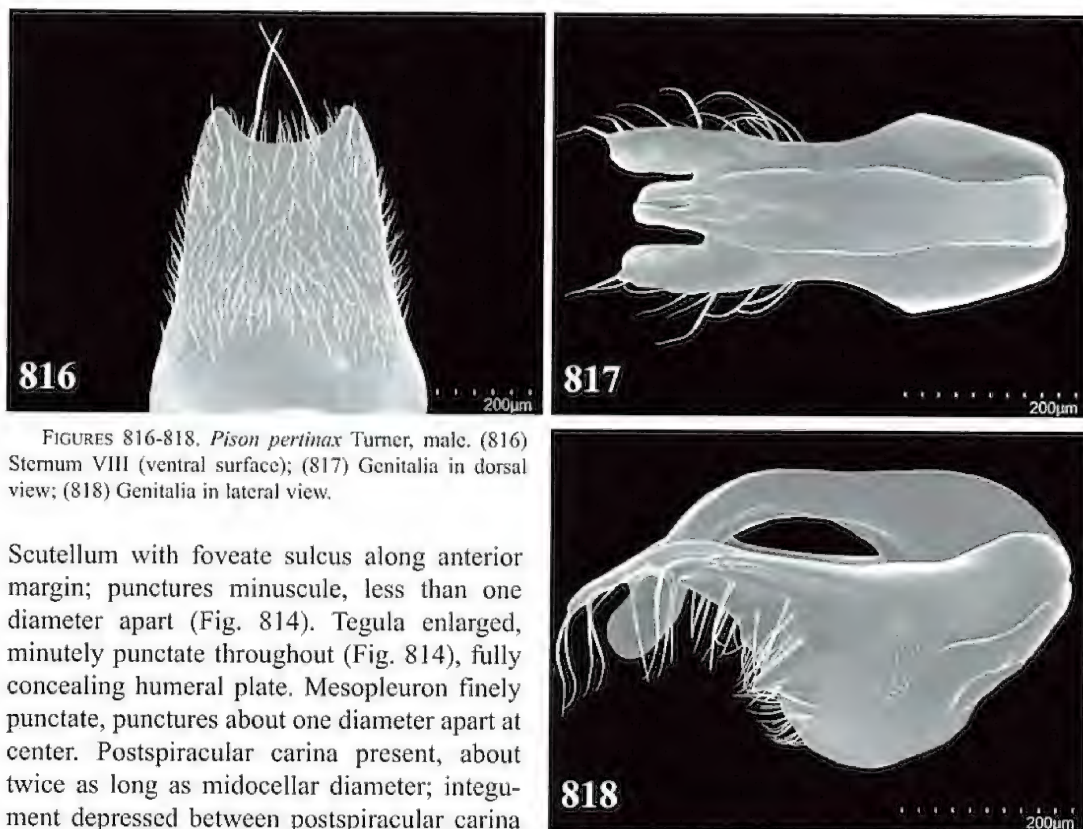
815

FIGURES 811-815. *Pison pertinax* Turner. (811) Female clypeus and mandibles; (812) Male clypeus and mandibles; (813) Left mandible of female; (814) Female tegula and adjacent scutum; (815) Apical part of forewing.

**RECOGNITION.**— *Pison pertinax* has only two submarginal cells (Fig. 815) and the tegula enlarged and minutely punctate throughout (Fig. 814). The female is unique among such species in having the free margin of the clypeus gently, evenly arcuate orbit to orbit, or only minimally concave on each side of the middle section (Fig. 811), and in having the mandible bidentate apically (Fig. 813). The male has the upper interocular distance slightly larger than the lower interocular distance, and the fore margin of the lateral clypeal section is only slightly concave (Fig. 812). The ferruginous tibiae, tarsi, and gaster of the vast majority of specimens are subsidiary recognition features.

**DESCRIPTION.**— Frons and scutum dull, microscopically punctate, punctures almost contiguous. Transverse groove present just behind hindocelli. Labrum with deep U-shaped median emargination, giving it bilobed appearance. Anteromedian pronotal pit transversely elongate, about as long as  $3.5 \times$  midocellar diameter. Scutum foveate or not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures minuscule, about one diameter apart.





FIGURES 816-818. *Pison pertinax* Turner, male. (816) Sternum VIII (ventral surface); (817) Genitalia in dorsal view; (818) Genitalia in lateral view.

Scutellum with foveate sulcus along anterior margin; punctures minuscule, less than one diameter apart (Fig. 814). Tegula enlarged, minutely punctate throughout (Fig. 814), fully concealing humeral plate. Mesopleuron finely punctate, punctures about one diameter apart at center. Postspiracular carina present, about twice as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus well defined, not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, with short transverse ridges emerging from its admedian side (admedian side slightly concave); dorsum punctate (interspaces merging into ridges that are mostly inconspicuous but conspicuous basally) or obliquely ridged (punctate between ridges); side punctate, with a few ridges beneath spiracle; posterior surface ridged. Forewing with two submarginal cells; posterior margin of second cell equal to  $1.6-1.9 \times$  its height (Fig. 815). Posteroventral forefemoral surface microscopically, closely punctate. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I minute, about one diameter apart. Sterna minutely, closely punctate throughout.

All body setae silvery, appressed, inconspicuous, on lower frons oriented ventrad, on upper frons (between dorsal end of midfrontal carina and midocellus) oriented dorsally, on clypeus silvery and not concealing integument, not forming setal fasciae on apical depressions of terga.

Head, thorax, propodeum, and femora black; mandible black basally and apically, ferruginous mesally; antenna ferruginous (scape, pedicel, and apical flagellomeres dark dorsally in most specimens, apical flagellomere all dark in some specimens); tibiae and tarsi ferruginous in most specimens, but all black in single specimen from Kuranda, Queensland; gaster in most specimens ferruginous, but tergum I and most of terga II and III black in female from Wollemi National Park, all gaster black in female from Kuranda and that from Nadgee Nature Reserve.

♀.—Upper interocular distance  $0.95-1.0 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli  $1.0-1.1 \times$  hindocellar diameter; eye height equal to  $1.04-1.08 \times$  distance between eye notches. Clypeus with carina at base of lamella,

surface concave between carina and free margin; free margin gently, evenly arcuate orbit to orbit or only minimally concave on each side of middle section (Fig. 811), lobe practically not differentiated. Dorsal length of flagellomere I  $2.2\text{--}2.5 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width. Mandible bidentate apically, ventral tooth broad (Fig. 813); trimmal carina minimally incised shortly beyond midlength. Length 6.8–7.2 mm; head width 1.6–1.8 mm.

♂.—Upper interocular distance equal to  $1.23 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.12 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 812). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere X  $0.8 \times$  apical width. Sternum VIII broadly emarginate apically (Fig. 816). Genitalia: Figs. 817, 818. Length 5.7 mm; head width 1.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 819).—New South Wales, Northern Territory, Queensland, South Australia.

**RECORDS.**—**AUSTRALIA:** **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (2 ♀, CAS), Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$  (1 ♀, CAS), Lake George Cullerin (1 ♀, UCD), 0.5 km SE Lansdowne (1 ♀, ANIC), Lorient Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (1 ♀, AMS), Nadgee Nature Reserve south of Newton's Beach (1 ♀, ANIC), 23 km SE Tamworth (1 ♀, ANIC), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (2 ♀, 1 ♂, CAS), Wolllemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (1 ♀, CAS). **Northern Territory:** Gregory National Park at  $15^{\circ}58'17"S$   $130^{\circ}29'17"E$  (1 ♀, ANIC), Serpentine Gorge in West MacDonnell National Park 84 km W Alice Springs at  $23^{\circ}45.0'S$   $132^{\circ}58.7'E$  (1 ♀, CAS). **Queensland:** Brisbane (1 ♀, ANIC), Cairns (Turner, 1916b), Carnarvon National Park at  $25^{\circ}04.0'S$   $148^{\circ}14.7'E$  (1 ♀, CAS), Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$  (9 ♀, CAS), 16 km N Heathlands Homestead at  $11^{\circ}41'S$   $142^{\circ}42'E$  (1 ♀, QMB), Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$  (3 ♀, CAS), Kuranda (1 ♀, BMNH), Mackay (12 ♀, BMNH, including lectotype and 7 paralectotypes of *Pison pertinax*), Mission Beach (1 ♀, AMS). **South Australia:** Elder Range, (1 ♂, SAM), Oraparinna Creek in Flinders Ranges National Park at  $31^{\circ}21'S$   $138^{\circ}42'E$  (4 ♀, ANIC), 79 km NNW Renmark at  $33^{\circ}31'S$   $140^{\circ}24'E$  (1 ♀, ANIC), Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$  (1 ♀, CAS).



FIGURE 819. Collecting localities of *Pison pertinax* Turner.

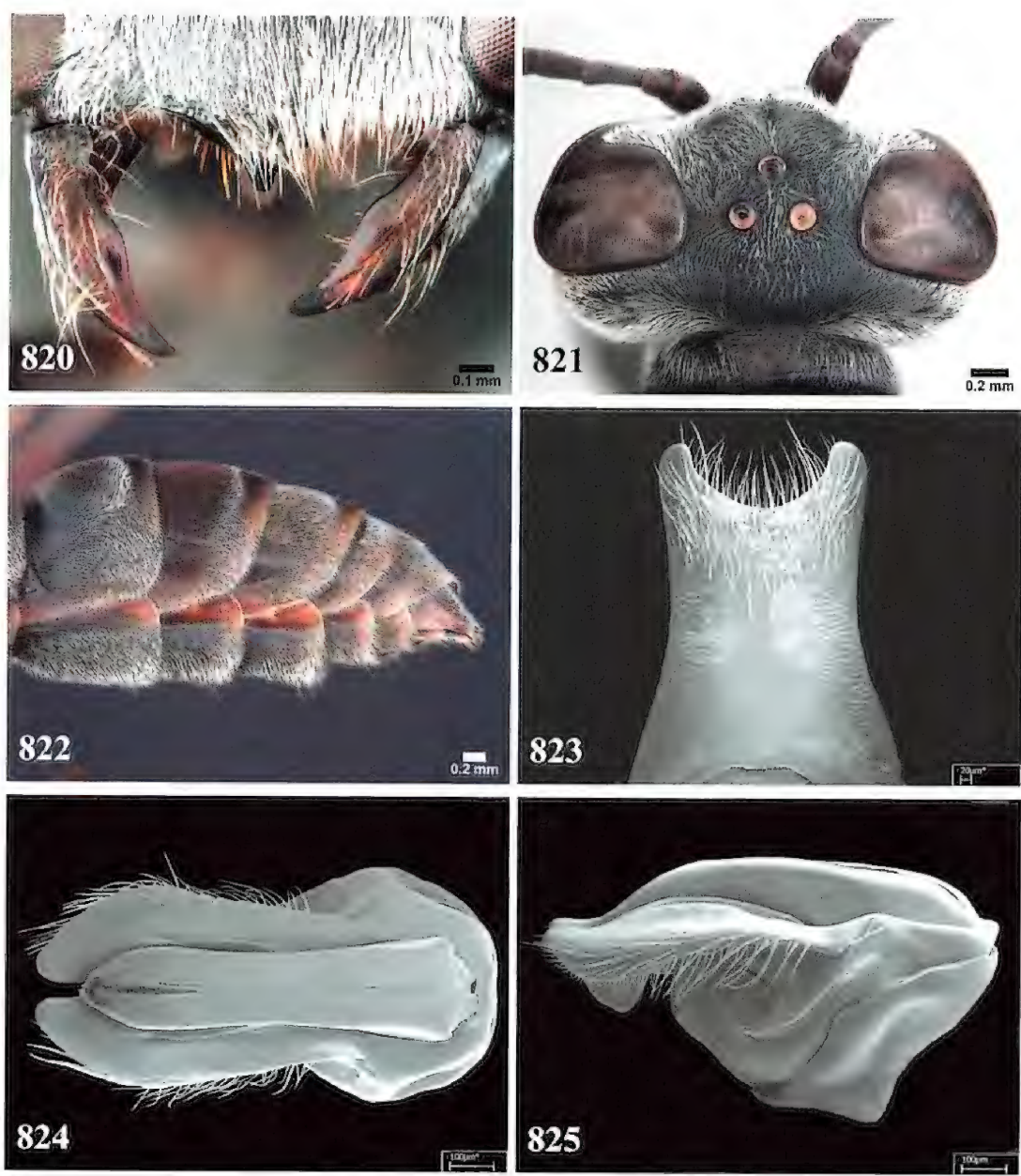
### *Pison petraeum* Pulawski, species nova

Figures 820–826.

**NAME DERIVATION.**—*Petraeum* is a Latin neuter adjective meaning *that grows or lives in rocky places*; with reference to Split Rock, Queensland, Australia, where the type series was collected.

**RECOGNITION.**—*Pison petraeum* is an all black species, with three submarginal cells, the second recurrent vein joining the second submarginal cell near its apex or interstitial with the second intersubmarginal vein, the setae appressed on tergum I, and the male clypeal lamella acutely angulate. The female is unknown and the male shares with *P. excisum* and *P. perplexum* an unusually deeply emarginate sternum VIII (Fig. 823), markedly more so than in *P. auratum*, *P. batavum*, *P. emarginatum*, and *P. vestitum*. It differs from *P. excisum* in having the ocellocular distance  $1.4\text{--}1.6 \times$  midocellar diameter (rather than  $1.0 \times$ ) and larger than the distance between the hindocelli (Fig. 821), rather than smaller, the setae of the lower gena straight or curved apically





FIGURES 820-825. *Pison petraeum* Pulawski, sp. nov., male. (820) Clypeus and mandibles; (821) Head in dorsal view; (822) Gaster in lateral view; (823) Sternum VIII (ventral surface); (824) Genitalia in dorsal view; (825) Genitalia in lateral view.

(rather than sinuous), the propodeum with a longitudinal carina separating the side from the dorsum and posterior surface (carina absent in *P. excisum*), and the margins of the emargination on sternum VIII diverging toward the apex (Fig. 823) rather than converging. Unlike *P. perplexum*, the dorsal length of flagellomere I is  $2.2\text{--}2.3 \times$  apical width (rather than  $3.3 \times$ ), flagellomeres have no tyloids (tyloids present on flagellomeres II-V) and are cylindrical (flagellomeres III and IV concave basoventrally, convex apicoventrally, at least slightly so), the apical margin of sternum VII is markedly concave (rather than straight), and sternum VIII is not bent ventrally (conspicuously bent so in *P. perplexum*).

**DESCRIPTION.**—Frons somewhat swollen at level of scape tips, dull, finely punctate, punctures about one diameter apart. Occipital carina joining hypostomal carina. Gena moderately large in dorsal view (Fig. 821). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum foveate or not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures conspicuous, most of them compressed against each other. Postspiracular carina rudimentary. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum in most specimens with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, without such carina in some; dorsum obliquely ridged, punctate between ridges; side punctate, interspaces merging into fine, irregular ridges; posterior surface conspicuously ridged, punctate between ridges. Outer surface of hindtibia with evanescent spines. Punctures of tergum I well defined, more than one diameter apart at center of horizontal portion. Sterna conspicuously punctate throughout.

Setae silvery, appressed on postocellar area, appressed on scutum and tergum I, on lower gena subappressed, straight or curved apically, up to about one midocellar diameter long, oriented ventrally on lower frons, oriented radially around midocellus; completely concealing integument on clypeus (except lamella). Apical depressions of terga with silvery, setal fasciae; sterna II-VII with short erect setae (Fig. 822), longest setae on sternum VI up to  $0.7 \times$  midocellar diameter.

Body all black.

♀.—Unknown.

♂.—Upper interocular distance equal to  $0.86\text{--}0.88 \times$  lower interocular distance; ocellocular distance equal to  $1.4\text{--}1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.96\text{--}0.98 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 820). Dorsal length of flagellomere I  $2.2\text{--}2.3 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Sternum VIII conspicuously emarginate apically, with inner margins of emargination diverging toward apex (Fig. 823). Genitalia: Figs. 824, 825. Length  $8.8\text{--}9.5$  mm; head width  $2.4\text{--}2.6$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 826).—Known from one locality in northern Queensland.

**RECORDS.**—HOLOTYPE: ♂, AUSTRALIA: Queensland: Split Rock at  $15^{\circ}39'S$   $144^{\circ}31'E$ , 18 Dec 1993 – 17 Jan 1994, P. Zborowski and E.D. Edwards (ANIC).



FIGURE 826. Collecting locality of *Pison petraeum* Pulawski, sp. nov.



PARATYPES: AUSTRALIA: **Queensland**: same data as holotype (3 ♂, CAS); same locality, 30 Oct – 24 Nov 1992, P. Zborowski and A. Calder (1 ♂, ANIC); same locality, 18 Nov – 18 Dec 1993, P. Zborowski (2 ♂, ANIC).

***Pison pilbara* Pulawski, species nova**

Figures 827-833.

**NAME DERIVATION.**— *Pilbara*, a large, dry region in the north of Western Australia, where the holotype was collected; a noun in apposition to the generic name.

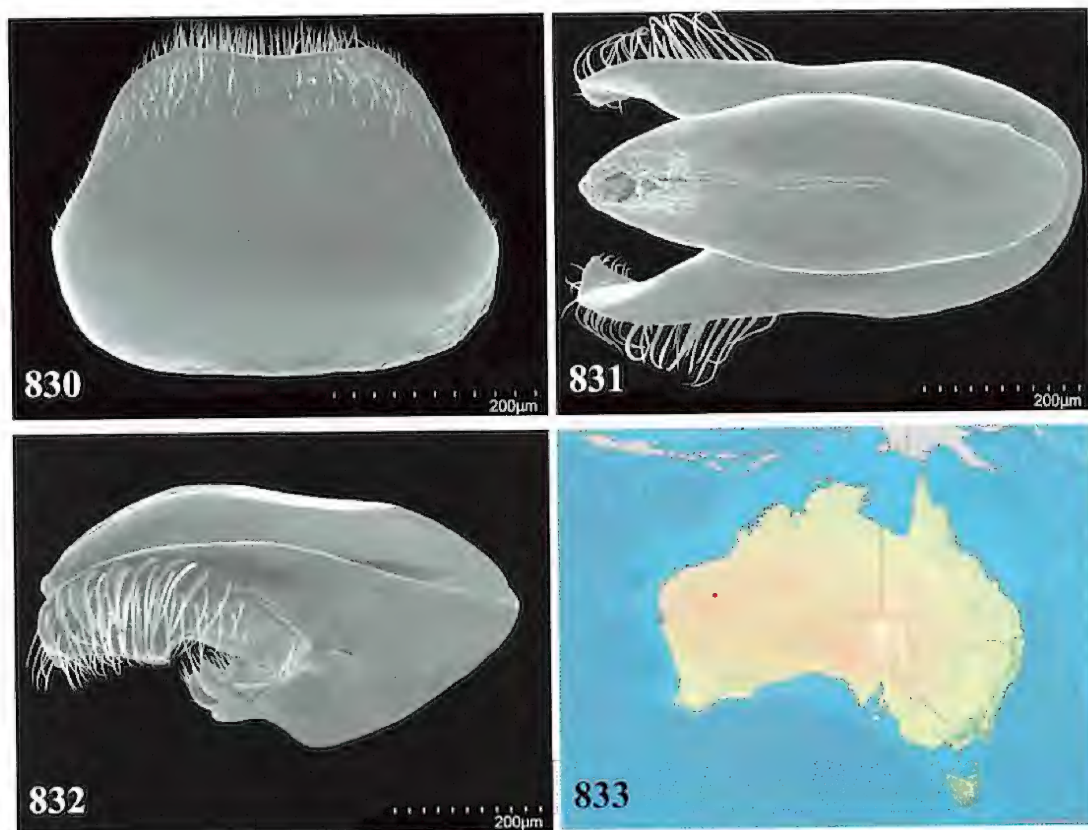
**RECOGNITION.**— *Pison pilbara*, known only from the male, is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, the setae erect (except posteriorly) on tergum I, but shorter than the midocellar diameter, and a small body size (length 5.4 mm). It is characterized by a broad hypostomal carina whose greatest height is about  $0.5 \times$  the midocellar diameter. Additionally, the mandible is simple apically and the male flagellomeres are simple, without tyloids. Three other species (*P. carinigerum*, *P. hypostomale*, and *P. separatum*) are similar, but *P. pilbara* differs in having the scutal punctures averaging 2-3 diameters apart (Fig. 829), the scutal setae erect, and male sternum VIII asetose except setose near the apical margin (Fig. 830). In the other three species, the scutal punctures average one diameter apart or less, the scutal setae are appressed, and male sternum VIII is setose.

**DESCRIPTION.**— Frons shallowly punctate, punctures averaging about one diameter apart; interspaces markedly microsculptured, dull; middle supraantennal carina replaced by fine, shallow sulcus. Hypostomal carina expanded, its greatest height about  $0.5 \times$  midocellar diameter. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 828). Labrum not emarginate.



Figures 827-829. *Pison pilbara* Pulawski, sp. nov., male.  
(827) Clypeus and mandible; (828) Head in dorsal view;  
(829) Tegula and adjacent scutum.





FIGURES 830-832. *Pison pilbara* Pulawski, sp. nov., male. (830) Sternum VIII (ventral surface); (831) Genitalia in dorsal view; (832) Genitalia in lateral view.

FIGURE 833. Collecting locality of *Pison pilbara* Pulawski, sp. nov.

Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, with minute longitudinal ridges adjacent to posterior margin; scutal punctures well defined, about 2-3 diameters apart; interspaces finely microareolate (Fig. 829). Tegula slightly enlarged, its outer margin convex except nearly straight anteriorly. Mesopleural punctures shallow, less than one diameter apart. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged; side ridged throughout, punctate between ridges; posterior surface with well-defined, transverse ridges, punctate between ridges. Posteroventral forefemoral surface with narrow, impunctate, unsculptured zone. Punctures of tergum I, anterior of apical depression, about one diameter apart. Sternum II mesally with punctures several diameters apart, sparsely punctate area narrowing toward base.

Setae silvery, erect on frons, postocellar area, and scutum, on frons and scutum up to  $1.5 \times$  as long as midocellar diameter; erect on tergum I (except posteriorly), but shorter than midocellar diameter; not concealing integument on clypeus; on lower gena sinuous, up to  $2.0 \times$  as long as midocellar length. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Unknown

♂.— Upper interocular distance equal to  $0.98 \times$  lower interocular distance; ocellocular distance



equal to  $1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $2.2 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 827). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Mandible with ill-defined abductor ridge. Sternum VIII unusually short, wide, impunctate and asetose except near apical margin; apical margin minimally emarginate, almost straight (Fig. 830). Genitalia: Figs. 831, 832. Length 5.4 mm; head width 1.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 833).—Known from a single locality in the Pilbara Region of Western Australia.

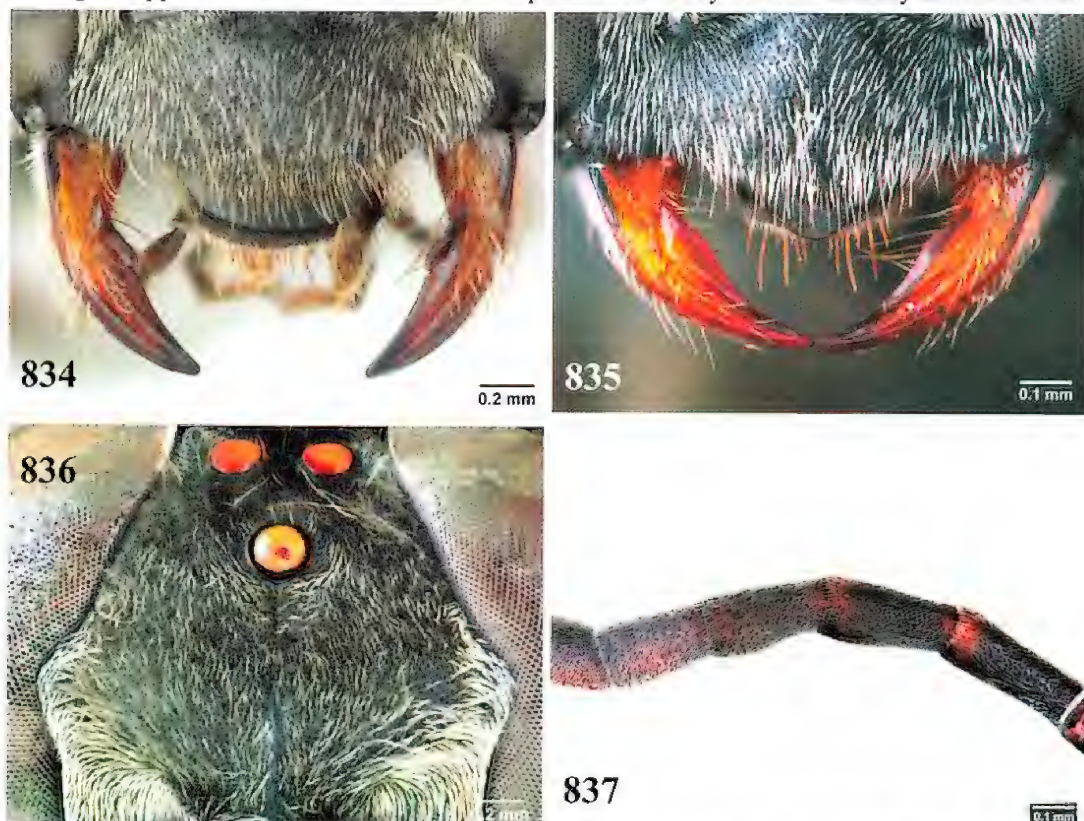
**RECORDS.**—HOLOTYPE: ♂, **AUSTRALIA: Western Australia:** 45 km S Newman on Great Northern Highway at  $23^{\circ}42.4'S$   $119^{\circ}44.3'E$ , 24 Apr – 6 May 2003, M.E. Irwin and F.D. Parker (ANIC).

*Pison pilifrons* Pulawski, species nova

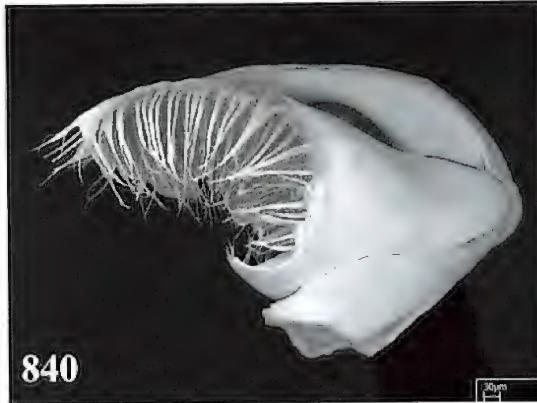
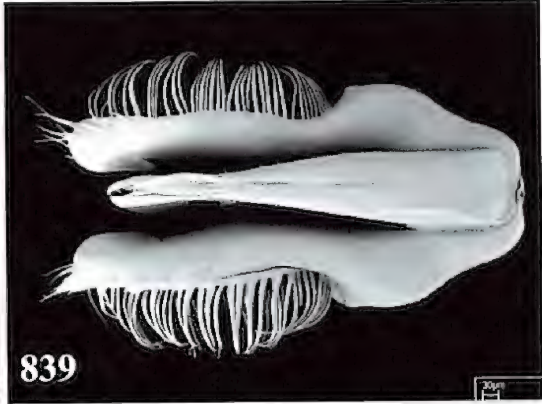
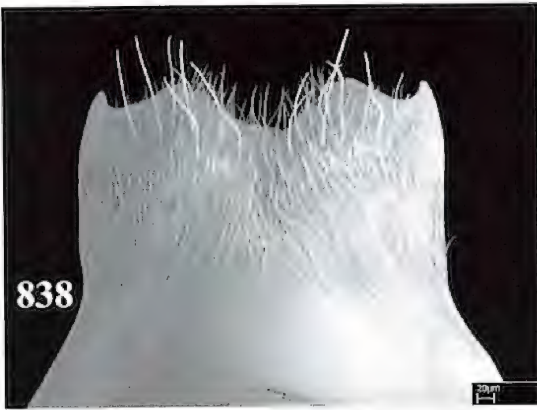
Figures 834–841.

**NAME DERIVATION.**—The name *pilifrons* derives from two Latin words: *pilus*, a hair; and *frons*, frons, with reference to this species unusual frons vestiture.

**RECOGNITION.**—*Pison pilifrons* has three submarginal cells, the second recurrent vein ending at the basal part of the third submarginal cell, setae appressed on tergum I, and an all black gaster. Like *P. aurifex*, *P. elongatum*, and *P. emarginatum*, it has the ferruginous tibiae, but no longitudinal carina separating the propodeal side from the dorsum and posterior surface. It is unique in having the appressed setae of the frons median portion uniformly oriented dorsally from the anten-



FIGURES 834–837. *Pison pilifrons* Pulawski, sp. nov. (834) Female clypeus and mandibles; (835) Male clypeus and mandibles; (836) Female frons showing orientation of setae; (837) Basal flagellomeres of male.



FIGURES 838-840. *Pison pilifrons* Pulawski, sp. nov., male. (838) Sternum VIII (ventral surface); (839) Genitalia in dorsal view; (840) Genitalia in lateral view.

nal socket to the midocellus (Fig. 836). It also differs from *P. aurifex*, *P. elongatum*, and *P. emarginatum* in having the punctures of the upper frons microscopically small, practically unrecognizable (rather than well defined), the mesopleural punctures 2-3 diameters apart near the center (rather than less to about one), the interspaces dull, markedly microsculptured (rather than shiny, unsculptured or finely microsculptured), and erect setae present on the scutum (rather than appressed only). The male differs from the three other species in having tyloids on flagellomeres II-IV and in having the venter of flagellomere III slightly concave basally and convex preapically (Fig. 837).

**DESCRIPTION.**—Frons dull, microscopically punctate, punctures practically unrecognizable, less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Propleuron with dense, minute punctures and with large, shallow punctures that average more than one diameter apart. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart, interspaces dull, markedly microsculptured. Tegula enlarged. Mesopleural punctures averaging 2-3 diameters apart, interspaces dull, conspicuously microsculptured. Postspiracular carina present, about twice as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, punctate between ridges; side ridged, punctate between ridges; posterior surface transversely ridged to irregularly rugose. Second recurrent vein ending on basal part of submarginal cell III. Forecoxal venter with small, dense punctures and large, sparse punctures. Posteroventral forefemoral surface with both minute, dense punctures, and large, scattered punctures. Hindcoxal dorsum with outer margin indistinctly carinate. Punctures of tergum I minute, less than one diameter apart. Sternum II minutely punctate throughout, punctures about one diameter apart.

Setae silvery, on frons both erect, sinuous and straight, appressed, appressed setae oriented uniformly dorsally between antennal socket and midocellus on the frons middle section (Fig. 836);



erect, sinuous on thorax, forecoxal venter, and fore- and midfemoral venters; appressed on tergum I; not concealing integument on clypeus; setae of lower gena sinuous, longer than basal mandibular width. Apical depressions of terga with silvery, setal fasciae (fasciae inconspicuous on terga IV and V).

Head, thorax, propodeum, femora, and gaster black; mandible black basally, yellowish brown medially, dark apically. Tibiae and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.54 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.16\text{--}1.18 \times$  distance between eye notches. Free margin of clypeal lamella broadly arcuate (Fig. 834). Dorsal length of flagellomere I  $3.0\text{--}3.2 \times$  apical width, of flagellomere IX  $1.7\text{--}1.8 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length  $9.3\text{--}10.2$  mm; head width  $2.6\text{--}2.8$  mm.

♂.—Upper interocular distance equal to  $0.60 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7 \times$  hindocellar diameter; eye height equal to  $1.22 \times$  distance between eye notches. Free margin of clypeal lamella roundly, obtusely angulate (Fig. 835). Flagellomeres II–IV with tyloids, venter of flagellomere III slightly concave basally and convex preapically (Fig. 837). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Apical margin of sternum VIII slightly convex except narrowly emarginate mesally, and with prominent lateral corner (Fig. 838). Genitalia: Figs. 839, 840. Length  $6.9$  mm; head width  $1.3$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 841).—Australian Capital Territory, New South Wales.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Australian Capital Territory: Canberra: Black Mountain, Nov 1981, I. Gould (BMNH).

PARATYPES: AUSTRALIA: Australian Capital Territory: same data as holotype (1 ♀, BMNH). New South Wales:  $0.5$  km SE Lansdowne near Taree, 6–15 Nov 1992, G.A. Williams (1 ♀, AMS),  $16$  km N Mudgee, 30 Nov 1982, D.S. Horning, Jr. (1 ♂, ANIC);  $4$  km W Sunny Corner at  $33^{\circ}22.7'S$   $149^{\circ}51.6'E$ , 11 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Urila  $28$  km S Queenbeyan, 7–15 Dec 1987, M.E. Irwin (1 ♀, CAS).



FIGURE 841. Collecting localities of *Pison pilifrons* Pulawski, sp. nov.

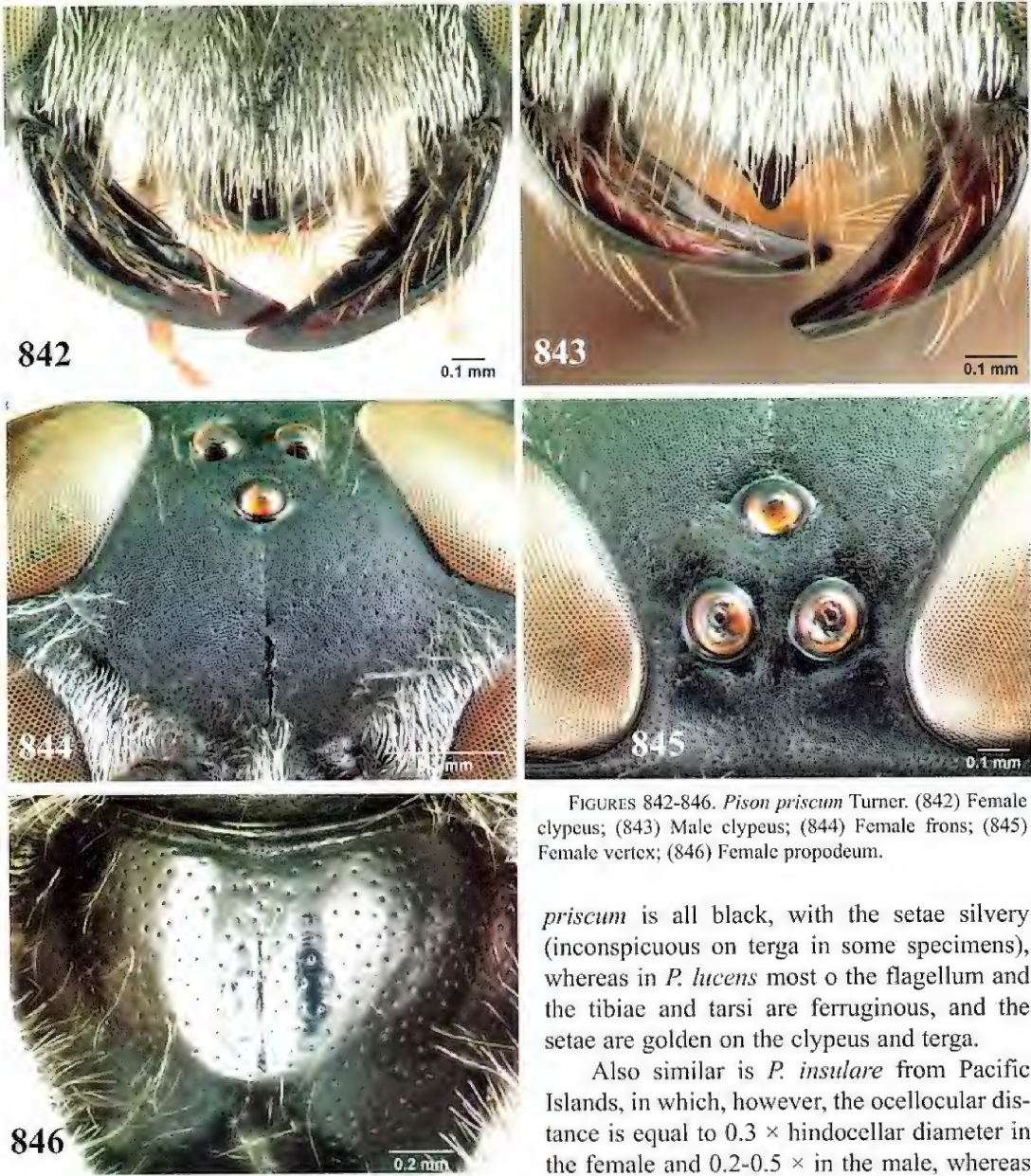
### *Pison priscum* Turner

Figures 842–850.

*Pison insulare* st. *priscum* Turner, 1908:510, ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. — As *Pison priscum*: Turner, 1916b:596 (in key to Australian *Pison*), 602 (new status, recognition characters); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**—Turner did not mention the number of the specimens examined in the original description of *Pison priscum*. I have designated as the lectotype the only existing specimen so labeled in The Natural History Museum, London.

**RECOGNITION.**—*Pison priscum* and *P. lucens* are the only two species in which the abundant, conspicuous erect setae on the head, thorax, propodeum and tergum I are combined with the sparsely punctate propodeum, with punctures averaging several diameters apart (Fig. 846) and the absence of the carina between the propodeal dorsum and posterior surface, and the side. *Pison*



FIGURES 842-846. *Pison priscum* Turner. (842) Female clypeus; (843) Male clypeus; (844) Female frons; (845) Female vertex; (846) Female propodeum.

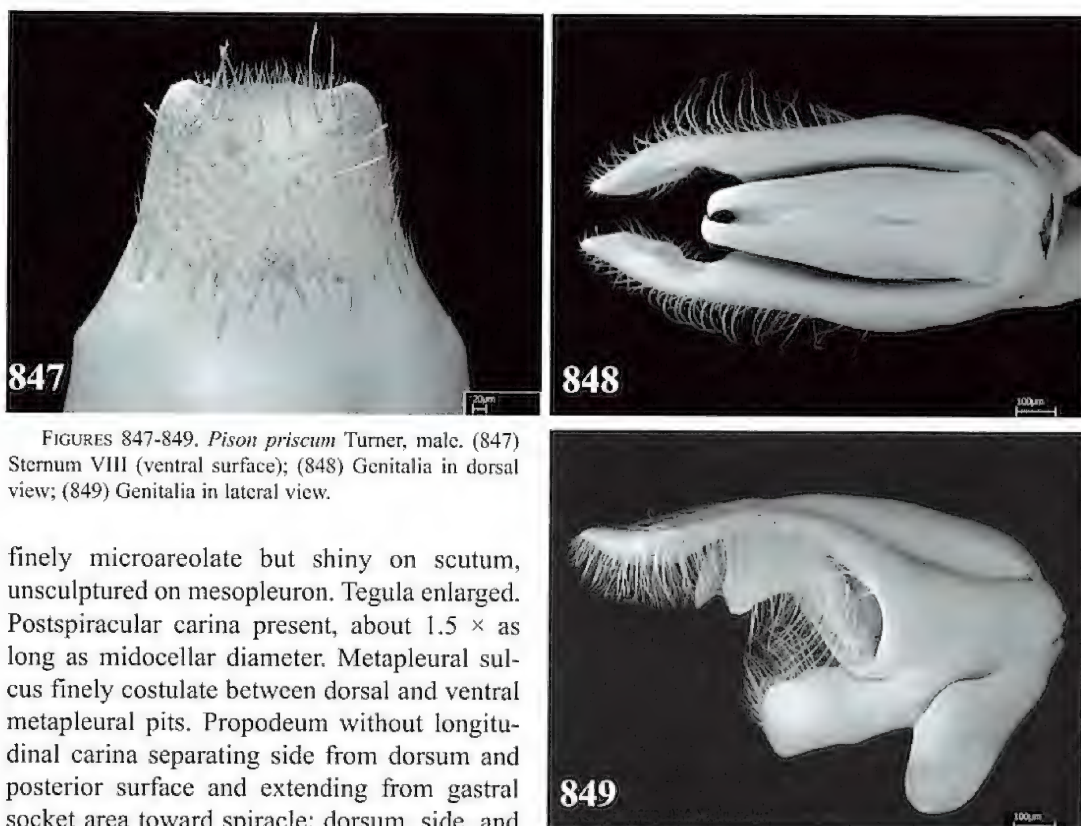
*priscum* is all black, with the setae silvery (inconspicuous on terga in some specimens), whereas in *P. lucens* most of the flagellum and the tibiae and tarsi are ferruginous, and the setae are golden on the clypeus and terga.

Also similar is *P. insulare* from Pacific Islands, in which, however, the ocellocular distance is equal to  $0.3 \times$  hindocellar diameter in the female and  $0.2\text{--}0.5 \times$  in the male, whereas

$0.6 \times$  and  $1.3 \times$ , respectively, in *P. priscum*, the erect setae of tergum I are  $0.3\text{--}1.0 \times$  midocellar diameter long (setae exceptionally all appressed), whereas up to  $2.0 \times$  midocellar diameter long in *P. priscum*, sternum II is impunctate mesally, whereas punctate throughout in *P. priscum*, and only two first terga have silvery, setal fasciae on the apical depressions, whereas four or five terga in *P. priscum* (fasciae may be ill defined on apical terga)

**DESCRIPTION.**—Frons dull, microareolate, with ill-defined punctures several diameters apart (Fig. 844). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $2.0 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin. Scutal and mesopleural punctures several diameters apart; interspaces





FIGURES 847-849. *Pison priscum* Turner, male. (847) Sternum VIII (ventral surface); (848) Genitalia in dorsal view; (849) Genitalia in lateral view.

finely microareolate but shiny on scutum, unsculptured on mesopleuron. Tegula enlarged. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus finely costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum, side, and posterior surface punctate, punctures averaging more than one diameter apart (several diameters apart in most specimens), posterior surface transversely ridged ventrally in many specimens; interspaces unsculptured, shiny. Posteroventral forefemoral surface with well-defined punctures that are several diameter apart. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I minute, many widths apart, 2-3 diameters apart on horizontal part (several diameters apart on apical depression). Sternum II with minute punctures many diameters apart mesally.

Setae silvery, erect on frons, gena, thorax, forecoxal venter, femoral venters, and tergum I; longest genal setae almost  $3.0 \times$  midocellar diameter; forming setal fasciae on apical depressions of terga in most specimens, but inconspicuous in some.

Head, thorax, propodeum, gaster, and legs black, including antenna and mandible.

♀.—Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter (Fig. 845); eye height equal to  $1.18 \times$  distance between eye notches. Free margin of clypeal lamella conspicuously arcuate (Fig. 842). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere IX  $1.6-1.7 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 9.3-13.4 mm; head width, 2.8-3.1 mm.

♂.—Upper interocular distance equal to  $0.9 \times$  lower interocular distance; ocellocular distance equal to  $1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella sharply pointed (Fig. 843). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Sternum VIII shallowly, broadly emarginate (Fig. 847). Genitalia: Figs. 848, 849. Length 7.6-9.1 mm; head width, 2.3-2.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 850).— New South Wales, Queensland, Victoria.

**RECORDS.**— **AUSTRALIA: New South Wales:** 5 km E Bilpin near Kurrajong (1 ♀, AMS), Cheltenham (1 ♀, AMS), Congo 8 km SE Moruya at 35°58'S 150°09'E (1 ♀, ANIC), Dorriggo National Park (1 ♀, AMS), Gibraltar Range National Park (1 ♂, AMS), Lord Howe Island: Mount Lidgebird (1 ♀, ANIC) and Old Settlement Creek (1 ♀, ANIC), Mount Dromedary near Narooma (1 ♀, ANIC), Mount Tomah (8 ♀, 6 ♂, AMS), Starrs Creek Forest Reserve near Lansdowne in vicinity of Taree (1 ♀, AMS), Wentworth Falls in Blue Mountains (1 ♀, AMS). **Queensland:** Bunya Mountains (3 ♀, AMS), Mackay (1 ♀, BMNH, lectotype of *Pison priscum*), Mission Beach (1 ♀, AMS), Mount Glorious at 27°20'S 152°45'E (2 ♀, 2 ♂, BMNH; 1 ♀, MNKB), Paluma Range National Park at 18°59.5'S 146°09.9'E (1 ♀, CAS). **Victoria:** Melbourne (1 ♀, BMNH), Mount Buffalo National Park (1 ♀, CAS), no specific locality (1 ♂, BMNH).



FIGURE 850. Collecting localities of *Pison priscum* Turner.

***Pison prostratum* Pulawski, species nova**

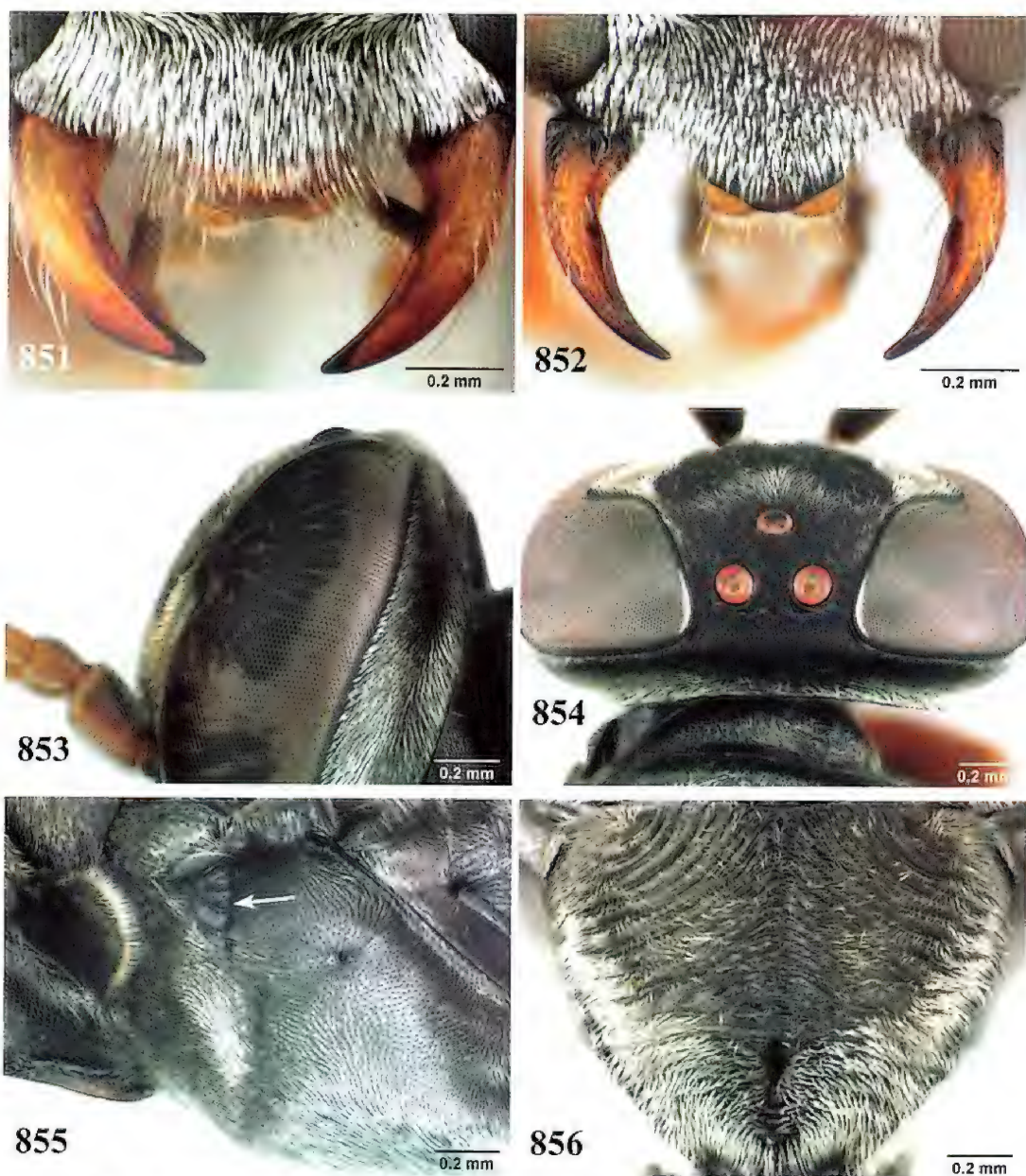
Figures 851-860.

**NAME DERIVATION.**— *Prostratum*, Latin neuter adjective meaning *prostrate*; with reference to the appressed setae of the frons, one of the diagnostic characters of this species.

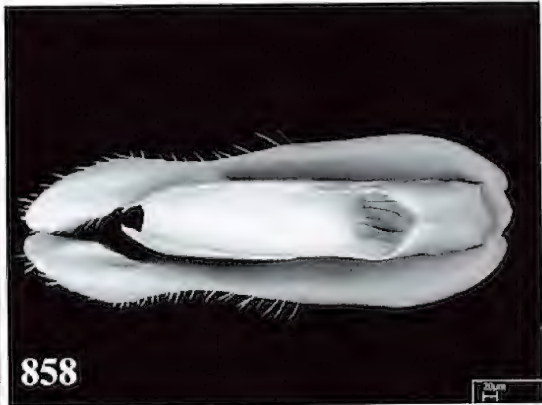
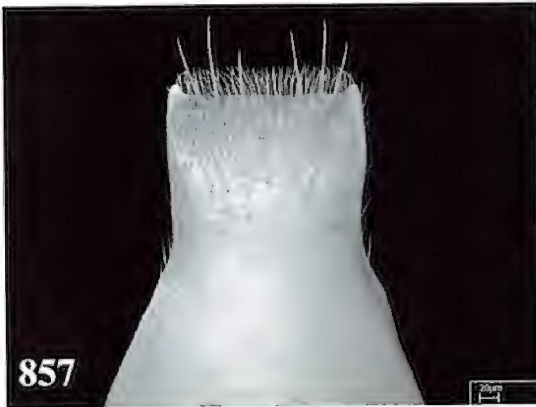
**RECOGNITION.**— *Pison prostratum* has the integument depressed between the postspiracular carina and the episternal sulcus and in the vast majority of specimens three submarginal cells, with the second recurrent vein received at the midlength of the second submarginal cell. One specimen examined, however, has two submarginal cells, with the second recurrent vein practically interstitial with the second intersubmarginal vein. The species closely resembles *P. argentatum* and *P. rufipes*, but differs in having the setae of the upper frons appressed rather than erect (Fig. 853), although in some specimens there are sparse erect setae up to  $0.5 \times$  midocellar diameter long (setal length about  $0.5 \times$  midocellar diameter in *argentatum* and  $1.0\text{--}1.5 \times$  midocellar diameter in *P. rufipes*). Also, in the vast majority of females of *P. prostratum* the ocellocular distance is shorter than the distance between the hindocelli (Fig. 854), whereas longer or equidistant in *P. rufipes* and about equidistant in *P. argentatum*, and in most females the free margin of the clypeal lamella is arcuate (Fig. 851), rather than truncate or broadly, obtusely angulate (*P. rufipes*) or with an obtuse median point (*P. argentatum*). The gaster of *P. prostratum* is black and combined with ferruginous tibiae in the vast majority of specimens (tibiae black in some), whereas in most *P. argentatum* both the gaster and the legs are black.

The specimen with two submarginal cells can be recognized by the following: gaster all black, tegula impunctate posterolaterally, ocellocular distance smaller than hindocellar diameter and interocellar distance, posterior margin of second submarginal cell  $1.6 \times$  its height, clypeal lobe differentiated (free margin concave laterally), clypeal lamella without median point, tergum I sessile, sternum II minutely punctate. *Pison bimbi* is similar, but *P. prostratum* differs in having the dorsally oriented setae on the frons forming a pair of patches below the midocellus (rather than without patches), the postspiracular carina present (rather than absent), the scutum with longitudinal ridges adjacent to the posterior margin (rather than without ridges), the mesopleural vestiture concealing the integument (not concealing in *P. bimbi*), the forefemur densely punctate throughout





FIGURES 851-856. *Pison prostratum* Pulawski, sp. nov. (851) Female clypeus and mandibles; (852) Male clypeus and mandibles; (853) Upper part of female head in profile showing predominantly appressed setae on frons; (854) Female head in dorsal view; (855) Female mesopleuron (arrow shows depressed portion); (856) Propodeal dorsum of female in dorsal view.



FIGURES 857-859. *Pison prostratum* Pulawski, sp. nov., male. (857) Sternum VIII (ventral surface); (858) Genitalia in dorsal view; (859) Genitalia in lateral view.

(posteroventral surface impunctate in *P. bimbi*), and the wing membrane hyaline (rather than yellowish).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures nearly compressed against each other. Distance between antennal socket and orbit slightly smaller than antennal socket width in female, about equal in male. Gena narrow in dorsal view (Fig. 854). Labrum

emarginate. Anteromedian pronotal pit transversely elongate, varying from about  $0.5 \times$  as long to  $1.5 \times$  as long as midocellar diameter. Scutum not foveate along flange in most specimens, with short, well defined longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart; scutal flange slightly projecting beyond anterior margin of axilla in some specimens. Tegula enlarged. Mesopleural punctures superficial, fine, less than one diameter apart; interspaces markedly microareolate. Postspiracular carina present, about as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus (Fig. 855). Metapleural sulcus costulate or not between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum conspicuously obliquely ridged (Fig. 856); side punctate and also ridged at least dorsally and posteriorly; posterior surface conspicuously transversely ridged, punctate between ridges. Forewing in vast majority of specimens with three submarginal cells and second recurrent vein ending at midlength of submarginal cell II, but with two submarginal cells and the second recurrent vein practically interstitial with second intersubmarginal vein in one specimen from Gregory National Park, Northern Territory (except for wing venation, the specimen is fully identical with other *P. prostratum*). Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I minute, averaging about one diameter apart on horizontal part. Sterna finely, evenly punctate or sternum II in female with punctures evanescent apically.

Setae silvery, appressed on frons (Fig. 853), scutum, and tergum I (frons in some specimens with a few erect setae that are up to  $0.5 \times$  midocellar diameter long), forming patch of dorsally oriented setae on upper frons (between dorsal end of middle carina and midocellus); completely



concealing integument on clypeus except lamella; lower gena with suberect, straight setae, much shorter than midocellar diameter. Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black; mandible yellowish red, dark brown basally and apically; scape either all black or ferruginous ventrally; flagellum either all ferruginous, or darkened dorsally, or all black. Femora, tibiae, and tarsi ferruginous or forefemur partly black in vast majority of specimens, and spurs whitish; tibiae largely black in two males from Keep River National Park, nearly all black in seven males from Gregory National Park, and all legs black in one male from Victoria Highway near Saddle Creek crossing, all three localities are in the Northern Territory.

♀.—Upper interocular distance equal to  $0.80\text{--}0.92 \times$  lower interocular distance; ocellocular distance equal to  $0.6\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9\text{--}1.2 \times$  hindocellar diameter; eye height equal to  $1.06\text{--}1.10 \times$  distance between eye notches. Free margin of clypeal lamella slightly arcuate (Fig. 851), but straight, with minuscule median point, in some specimens from New South Wales. Dorsal length of flagellomere I  $1.8\text{--}2.5 \times$  apical width, of flagellomere IX  $0.9\text{--}1.1 \times$  apical width. Mandible: trimmal carina with minuscule incision at about one third of length, area basally to incision slightly broadened in many specimens. Length  $5.8\text{--}7.6$  mm; head width  $1.7\text{--}2.1$  mm.

♂.—Upper interocular distance equal to  $0.94\text{--}1.00 \times$  lower interocular distance; ocellocular distance equal to  $0.7\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $1.04\text{--}1.08 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate to obtusely angulate to prominently rounded (Fig. 852). Dorsal length of flagellomere I  $1.6\text{--}2.0 \times$  apical width, of flagellomere X  $1.0\text{--}1.1 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 857). Genitalia: Figs. 858, 859. Length  $6.2\text{--}7.1$  mm; head width  $1.8\text{--}2.1$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 860).—All Australia including Tasmania.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **Queensland:** Split Rock 14 km SE Laura at  $15^{\circ}39'S$   $144^{\circ}31'E$ , 18 Dec 1993 – 17 Jan 1994, P. Zborowski and E.D. Edwards (ANIC).

**PARATYPES:** **AUSTRALIA:** **Australian Capital Territory:** Black Mountain, Feb 1982, J.R.T. Short and C. Tidemann (1 ♂, ANIC) and 8 Jan 1988, M.E. Irwin (1 ♀, UCD); Canberra, E. McC Callan, 23 Jan 1980, 1 Jan 1982, and 23 Nov 1982 (3 ♀, ANIC), 26 Dec 1985 (2 ♂, ANIC); Farrer, southern suburb of Canberra at  $35^{\circ}22'S$   $149^{\circ}05'E$ , 15 Dec 1987, D.C.F. Rentz (1 ♀, ANIC); Wombat Creek 6 km NE Piccadilly Circus at  $35^{\circ}19'S$   $148^{\circ}51'E$ , Jan 1984, Weir, Lawrence, and Johnson (1 ♀, ANIC). **New South Wales:** Bronte, D.K. McAlpine, 12 Feb 1953 (1 ♀, AMS), 31 Oct 1953 (1 ♂, AMS), and 15 Nov 1958 (1 ♀, AMS); Brulee at  $35^{\circ}51'S$   $150^{\circ}11'E$ , 26 Dec 1995, M.S. Upton (1 ♀, ANIC); Burrendong Botanic Garden at  $32^{\circ}42.1'S$   $149^{\circ}06.2'E$ , 13 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , V. Ahrens and W.J. Pulawski, 25 Dec 2011 (14 ♀, 1 ♂, CAS), 27 Dec 2011 (1 ♀, CAS), 28 Dec 2011 (11 ♀, CAS), 29 Dec 2011 (16 ♀, 2 ♂, CAS); Fowlers Gap 114 km SW [correctly: NW] Broken Hill, 20 Dec 1988, G.J. and R.L. Langston (1 ♀, CAS); Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$ , 30 Dec 2011, V. Ahrens and W.J. Pulawski (8 ♀, 1 ♂, CAS); Helensburgh, 3 Dec 2006, Reid and Dungalhoef (1 ♀, AMS); Jervis Bay: Hyam's Beach, 10 Nov 1985, D.S. Hornung (1 ♀, ANIC); Kenthurst, 13 Mar 1983, N.W. Rodd (1 ♀, AMS); Killara, 15 Mar 1945, N.E. Kent (1 ♀,



FIGURE 860. Collecting localities of *Pison prostratum* Pulawski, sp. nov.

BMNH); Mosman at 33°50'S 151°14'E, 30 Mar 2008, F. Begg (1 ♀, AMS); Mount Tomah in Blue Mountains, 1 Jan 1992, N.W. Rodd (1 ♀, AMS); Nadgee Nature Reserve 10 km S Newton Beach, E.A. Sugden, 18 Aug 1986 and 4 Jan 1987 (2 ♀, ANIC), and 21 Aug 1986 (1 ♂, ANIC); 40.5 km SW Narrabri at 30°37.7'S 149°34.1'E, 3 and 5 Jan 2012, V. Ahrens and W.J. Pulawski (2 ♀, CAS); Pearl Beach, 13 Jan 1987, D.B. McCorquodale (1 ♀, ANIC); 4 km W Sunny Corner at 33°22.7'S 149°51.6'E, 11 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Sydney, no date, C. Gibbons (1 ♀, AMS); Sydney: Artarmon, 28 Dec 1988, C.E. Chadwick (1 ♀, AMS); Sydney: Australian Museum, 20 Mar 1974, D.K. McAlpine (1 ♀, AMS) and 5 Dec 1977, B.J. Day (1 ♀, AMS); Sydney: Camperdown, 1 Feb 1984, J. Mac Donald (1 ♀, ANIC); Sydney: Cheltenham, 22 Oct 1949, no collector (1 ♂, AMS); Sydney: Manly: Kangaroo Park at 33°48'S 151°18'E, 20 Nov and 28 Dec 1982, 26 Dec 1985, D.S. Horning (3 ♀, ANIC), 29 Nov 1992 (1 ♀, ANIC); Sydney: North Ryde, 30 Jan 1986, C.E. Chadwick (1 ♀, AMS); Warrenburg National Park, 20 Dec 1987, M.E. Irwin (1 ♀, UCD); Warrumbungle National Park, 8 Nov 1965, E.M. Exley (1 ♀, QMB), Warrumbungle National Park at 31°16.9'S 148°59.1'E, 17 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♂, CAS); near Warrumbungle National Park at 31°16.9'S 149°04.8'E, V. Ahrens and W.J. Pulawski, 2 Jan 2012 (1 ♀, CAS); Wentworth Falls, 12 Dec 1980, D.K. McAlpine and B.J. Day (1 ♀, AMS); 60 km N Windsor, 16 Feb 1984, D.K. McAlpine (1 ♀, AMS); Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E, V. Ahrens and W.J. Pulawski, 7 Jan 2012 (3 ♀, CAS) and 8 Jan 2012 (3 ♀, CAS). **Northern Territory:** Gregory National Park at 15°36'43"S 130°24'08"E, 15-18 June 2001, E. Irwin, F.D. Parker, and C. Lambkin (4 ♀, CAS), at 16°06.6'S 130°25.7'E, 24 May - 4 June 2001, E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, 3 ♂, CAS, the female has two submarginal cells), at 16°06.7'S 130°25.4'E, 12-16 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♂, CAS), at 16°06'42"S 130°25'23"E, 24 May - 5 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, ANIC; 4 ♂, CAS), and at 16°08.9'S 130°26.6'E, 5-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Keep River National Park at 15°36'43"S 130°24'08"E, 15-18 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), and at 15°44'17"S 129°06'55"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 7-8 June 2001 (1 ♂, ANIC; 2 ♂, CAS) and 8-9 June 2001 (1 ♂, ANIC); Victoria Highway near Saddle Creek crossing at 15°56'11"S 129°35'22"E, 6-13 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Waterhouse Range 39 km SSW Alice Springs at 23°59'S 133°38'E, 11 Oct 1978, J.C. Cardale (1 ♀, ANIC). **Queensland:** 7 km S Batavia Downs at 12°43'S 142°42'E, 24 Mar - 17 June 1993, P. Zborowski and I.D. Naumann (1 ♂, ANIC); Cockatoo Creek at 11°39'S 142°27'E, 22 Jan - 19 Feb 1994, P. Zborowski (1 ♀, ANIC); Coen at 13°57'S 143°12'E, 17 Dec 1993 - 13 Jan 1994, P. Zborowski and E.D. Edwards (3 ♀, 1 ♂, ANIC); 9 km S Dingo Beach at 20°05.5'S 148°30.2'E, 26 Nov 2012, V. Ahrens and W.J. Pulawski (2 ♀, CAS); 12 km NE Heathlands, 15-26 Jan 1992, I.D. Naumann (1 ♀, ANIC); Homevale National Park at 21°26.9'S 148°32.4'E, 27 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Mid Queensland: no specific locality or date, R.C.L. Perkins coll. (1 ♂, BMNH); Mornish at Louisa Creek, 21 Nov 1971, C.G. Roche (1 ♀, CAS); Musselbrook Camp at 18°36'S 138°08'E, I.D. Naumann (1 ♂, ANIC); Rocky Creek 44 km N Moreton, 2 July 1975, S.R. Monteith (1 ♀, ANIC); 2 km N Rokeby at 13°39'S 142°40'E, 15 Aug - 13 Sept 1993, P. Zborowski and S. Shattuck (1 ♀, ANIC), 26 Oct - 16 Nov 1993, P. Zborowski and M. Horak (2 ♀, ANIC), 16 Nov - 17 Dec 1993, P. Zborowski (5 ♀, ANIC), and 15 Feb - 18 Mar 1994, P. Zborowski and M. Shaw (1 ♀, ANIC); Split Rock 14 km SE Laura at 15°39'S 144°31'E, 28 May - 28 June 1993, P. Zborowski and I.D. Naumann (1 ♀, ANIC), 24 June - 29 July, P. Zborowski and E.S. Nielsen (4 ♀, ANIC), 24 Aug - 21 Sept 1992, P. Zborowski and L. Miller (6 ♀, ANIC), 30 Oct - 24 Nov 1992, P. Zborowski and A. Calder (3 ♀, ANIC), 26 June - 16 July 1993, K. Halfpapp and S. De Faveri (1 ♀, ANIC), 16 July - 18 Aug 1993, P. Zborowski and J. Balderston (1 ♀, ANIC), 18 Aug - 16 Sept 1993, P. Zborowski and S. Shattuck (3 ♀, 2 ♂, ANIC), 16 Sept - 19 Oct 1993, P. Zborowski and D. Rentz (3 ♀, 1 ♂, ANIC), 19 Oct - 18 Nov 1993, P. Zborowski and M. Horak (1 ♂, ANIC), 18 Nov - 18 Dec 1993, P. Zborowski (3 ♀, ANIC), 18 Dec 1993 - 17 Jan 1994, P. Zborowski and E.D. Edwards (1 ♀, ANIC); Split Rock 14 km SE Laura at 15°39'S 142°42'E, 29 June - 24 Aug 1992, P. Zborowski and J.C. Cardale (8 ♀, 1 ♂, ANIC); Wenlock River at Moreton, 30 June 1975, S. R. Monteith (1 ♂, ANIC). **South Australia:** Aroona Ruins in Flinders Ranges National Park at 31°17'S 138°35'E, 9 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♂, ANIC); Dingly Dell Camp on Oraparinna Creek in Flinders Ranges National Park at 31°21'S 138°42'E, I.D. Naumann and J.C. Cardale, 4-10 Nov 1987 (1 ♂, ANIC); North Flinders Ranges 50 km SSW Balcanoona, 9 Jan 1998, R. Leys and R.V. Hensen (1 ♀, SAM); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, V. Ahrens and W.J. Pulawski, 22 Dec 2010 (3 ♀,



CAS), 26 Jan 2011 (3 ♀, CAS), 27 Jan 2011 (1 ♀, CAS), and 28 Jan 2011 (2 ♀, CAS); 3 km ENE Wilpena at 31°31.0'E 138°36.6'E, V. Ahrens and W.J. Pulawski, 26 Jan 2011 (4 ♀, CAS) and 27 Jan 2011 (3 ♀, CAS). **Tasmania:** Hobart: Sandy Bay, 18-21 Jan 1983, D. Bickel (2 ♀, ANIC); Lancelton: Newstead, Dec 1980, S. Fearn (1 ♀, ANIC). **Victoria:** Balwyn, 8 Mar 1982, M.S. Harvey (1 ♀, ANIC); Frankston, 11 Dec 1971, C.G. Roche (1 ♂, CAS); Melbourne, no date or collector (1 ♂, BMNH). **Western Australia:** Carson escarpment at 14°49'S 126°49'E, 9-15 Aug 1975, I.F.B. Common and M.S. Upton (5 ♀, ANIC); 10 km W Cobra Station at 24°10.2'S 116°23.0'E, 26 Apr – 10 May 2003, M.E. Irwin and F.D. Parker (1 ♂, ANIC); Kimberley: Lennard River crossing at 17°23'S 124°44'E, 14-28 July 1988, T.F. Houston (2 ♀, 1 ♂, WAM); 45 km S Newman on Great Northern Highway at 23°42.4'S 119°44.3'E, 24 Apr – 6 May 2003, M.E. Irwin and F.D. Parker (1 ♂, CAS).

***Pison protrudens* Pulawski, species nova**

Figures 861-872.

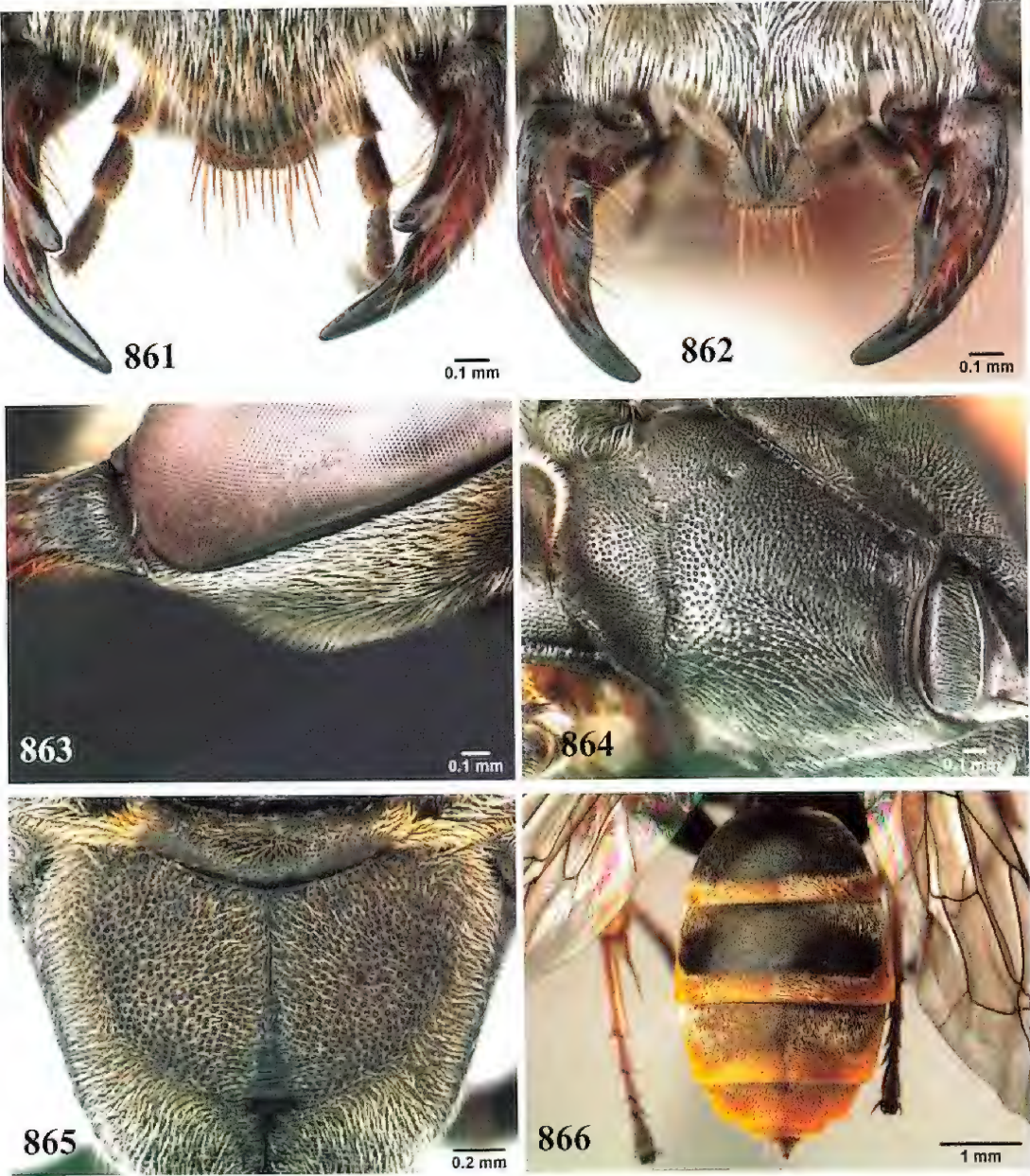
**NAME DERIVATION.**—*Protrudens*, Latin for *protruding*, with reference to the female clypeus of this species.

**RECOGNITION.**—*Pison protrudens* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, tegula partly impunctate and asetose, and setae appressed on tergum I. The gaster is all black, but the apical depressions of terga are brown and the tergal setae are golden in fresh specimens, forming golden fasciae on the apical depressions; the tibiae are ferruginous (the fore- and midtibiae can be partly black in the female). In addition, the setae of the lower gena are straight, curved apically, nearly erect, shorter than the midocellar diameter, those on the scutum are appressed, and those of the propodeal dorsum are unusually short, not concealing the integument and not extending over the lateral propodeal carina (Fig. 865); the metapleural sulcus is not costulate between the dorsal and ventral metapleural pits; the mesopleural punctures in many specimens are more than one diameter apart anteroventrally.

The female can be recognized, in addition to the above characters, by an elongate middle clypeal lobe, the free margin of the lamella conspicuously prominent, roundly triangular, the clypeal surface markedly convex above the lamella, and the trimmal mandibular carina with a preapical tooth (Fig. 861). The preapical tooth is also present in *P. decipiens*, *P. aridum*, and *P. impressiventre*, but in all three the clypeal lamella is less prominent, and the setae of the propodeal dorsum extend beyond the lateral carina. Also, in *P. decipiens* and *P. impressiventre* the setae are erect on the scutum and sinuous on the lower gena.

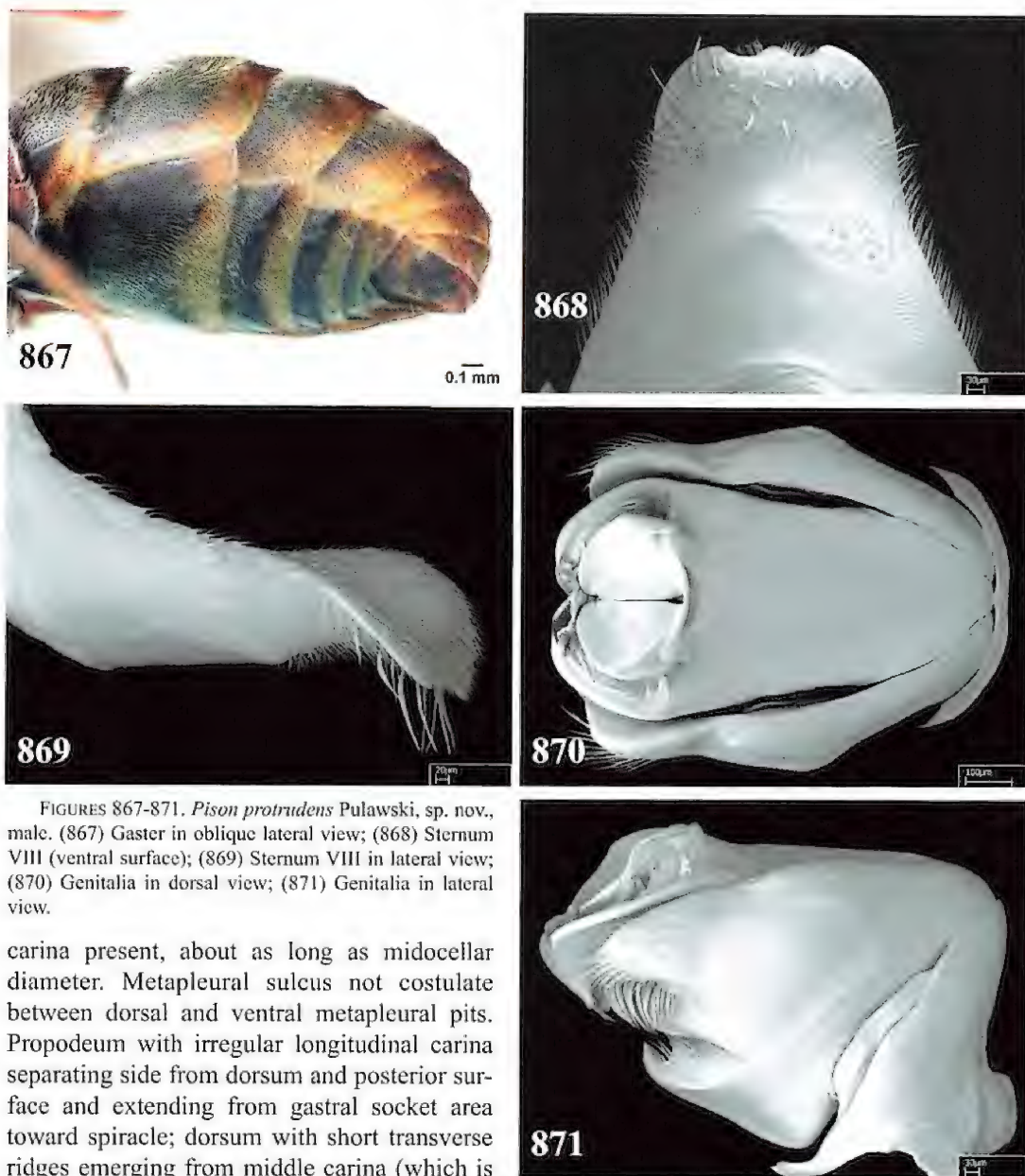
The male is characterized by the presence of an unsculptured, glabrous area before the apical depressions of sterna III-VI. This feature is shared with *P. impressiventre*, and many *P. decipiens*, but in *P. protrudens* the apical margin of sternum VI is concave, and sternum VII unsculptured mesally. The other two species differ in having the setae erect on the scutum and those of the propodeal dorsum extending beyond the lateral carina, and sternum VII minutely punctate. Additionally, in *P. decipiens* the apical margin of sternum VI is straight or nearly so, and *P. impressiventre* has a well-defined, round apicomedian impression on each sterna IV-VI which is absent in *P. protrudens*. The upper interocular distance slightly larger than the lower interocular distance is a subsidiary recognition feature.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures averaging about one diameter apart, interspaces unsculptured except for sparse microscopic punctures. Tegula slightly enlarged. Mesopleural punctures less than one diameter apart near center, in many specimens more than one diameter apart anteroventrally (Fig. 864), but posteriorly of episternal sulcus; interspaces unsculptured except for sparse micropunctures. Postspiracular



FIGURES 861-866. *Pison protrudens* Pulawski, sp. nov. (861) Female clypeus and mandibles; (862) Male clypeus and mandibles; (863) Female gena; (864) Female mesopleuron in slightly inclined view showing sparsely punctate anteroventral portion; (865) Propodeal dorsum of female; (866) Female gaster in dorsal view.





FIGURES 867-871. *Pison protrudens* Pulawski, sp. nov., male. (867) Gaster in oblique lateral view; (868) Sternum VIII (ventral surface); (869) Sternum VIII in lateral view; (870) Genitalia in dorsal view; (871) Genitalia in lateral view.

carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with short transverse ridges emerging from middle carina (which is evanescent in some specimens), otherwise closely punctate, interspaces merging into irregular, oblique ridges; side finely punctate, interspaces merging into minute ridges; posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures about one diameter apart. Punctures of tergum I less than one diameter apart. Sternum II punctate throughout.

Setae silvery on head and thorax except golden or with golden tinge on upper frons and scutum, golden on terga, forming conspicuous fasciae on apical depressions (Fig. 866); appressed on upper frons, scutum, and tergum I; oriented uniformly ventrally between dorsal end of middle carina and midocellus, not concealing integument on clypeus in female, completely concealing

from most angles in male (except lamella); setae of lower gena suberect, straight except curved apically, shorter than midocellar diameter, those of the propodeal dorsum unusually short, not extending over the lateral propodeal carina (Fig. 865).

Head, thorax, propodeum, and gaster black; mandible ferruginous mesally; apical depression of terga brown. Femora in female black, but hindfemur ferruginous apically in most specimens and all ferruginous in some, tibiae and tarsi ferruginous or fore- and midtibiae partly black; in male femora, tibiae, and tarsi ferruginous, or forefemur black basally (fore- and midfemora black dorsally in several specimens).

♀.— Upper interocular distance equal to  $0.82\text{--}0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $0.88\text{--}0.90 \times$  distance between eye notches. Middle clypeal lobe protruding, free margin of lamella prominently, roundly triangular (Fig. 861). Dorsal length of flagellomere I  $2.0\text{--}2.3 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with preapical tooth shortly beyond midlength. Length 10.3–10.4 mm; head width 2.8–2.9 mm.

♂.— Upper interocular distance equal to  $1.02\text{--}1.06 \times$  lower interocular distance; ocellocular distance equal to  $2.0\text{--}2.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 862). Dorsal length of flagellomere I  $1.7\text{--}2.3 \times$  apical width, of flagellomere X  $1.1\text{--}1.3 \times$  apical width. Sterna III–VI with shiny, unsculptured and asetose areas before apical depressions (Fig. 867). Apical margin of sternum VI concave; sternum VII unsculptured mesally. Sternum VIII with glabrous, round, basomedian area, shallowly, roundly emarginate apically (Fig. 868), apicolateral corner broadly rounded; in lateral view: Fig. 869. Genitalia: Figs. 870, 871. Length 5.2–8.5 mm; head width 1.9–2.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 872).— New South Wales, Northern Territory, South Australia, Western Australia

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: New South Wales: 87 km E Wilcannia at  $31^{\circ}42.8'S$   $144^{\circ}08.6'E$ , 23 Dec 2011, V. Ahrens and W.J. Pulawski (SAM).

PARATYPES: AUSTRALIA: New South Wales: 87 km E Wilcannia at  $31^{\circ}42.8'S$   $144^{\circ}08.6'E$ , V. Ahrens and W.J. Pulawski, 21 Dec 2011 (5 ♀, 2 ♂, CAS) and 23 Dec 2011 (23 ♀, 5 ♂, CAS). Northern Territory: Buchanan Highway 31 km SSE Victoria Highway at  $15^{\circ}57'37"S$   $130^{\circ}38'20"E$ , 14–15 June 2001, M.E. Irwin and F.D. Parker (1 ♂, CAS); Gregory National Park at  $15^{\circ}36'43"S$   $130^{\circ}24'08"E$ , 6–12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Keep River National Park at  $16^{\circ}06'47"S$   $130^{\circ}25'24"E$ , 15 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS). South Australia: Balcanoona in Gammon Ranges National Park, 9 Jan 1998, R. Leys and R.V. Hensen (1 ♀, SAM); Calperum Station 16 km N Renmark at  $34^{\circ}02.9'S$   $140^{\circ}42.2'E$ , V. Ahrens and W.J. Pulawski, 2 Dec 2010 (1 ♀, CAS) and 4 Dec 2010 (2 ♂, CAS); 79 km NW Renmark at  $33^{\circ}31'S$   $140^{\circ}24'E$ , 8 Nov – 12 Dec 1995, K.R. Pullen (1 ♀, ANIC); Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , V. Ahrens and W.J. Pulawski, 20 Dec 2010 (3 ♂, CAS), 22 Dec 2010 (1 ♀, CAS), 27 Dec 2010 (6 ♂, CAS); 3 km ENE Wilpena at  $31^{\circ}31.0'E$   $138^{\circ}36.6'E$ , V. Ahrens and W.J. Pulawski, 26 Jan 2011 (3 ♀, 3 ♂, CAS), 27 Jan 2011 (5 ♀, 4 ♂, CAS); 34 km S Wilpena, 4 Jan 1980, R.M. Bohart (4 ♀, UCD). Western Australia: 9.5 km SE Banjiwarr Homestead at  $27^{\circ}42'S$



FIGURE 872. Collecting localities of *Pison protrudens* Pulawski, sp. nov.



121°37'E, 22-18 Feb 1980, T.F. Houston et al. (1 ♀, WAM); Kathleen Valley, [no day or month] 1962, T. Moriarty (1 ♀, WAM).

***Pison psammophilos* Pulawski, species nova**

Figures 873-879.

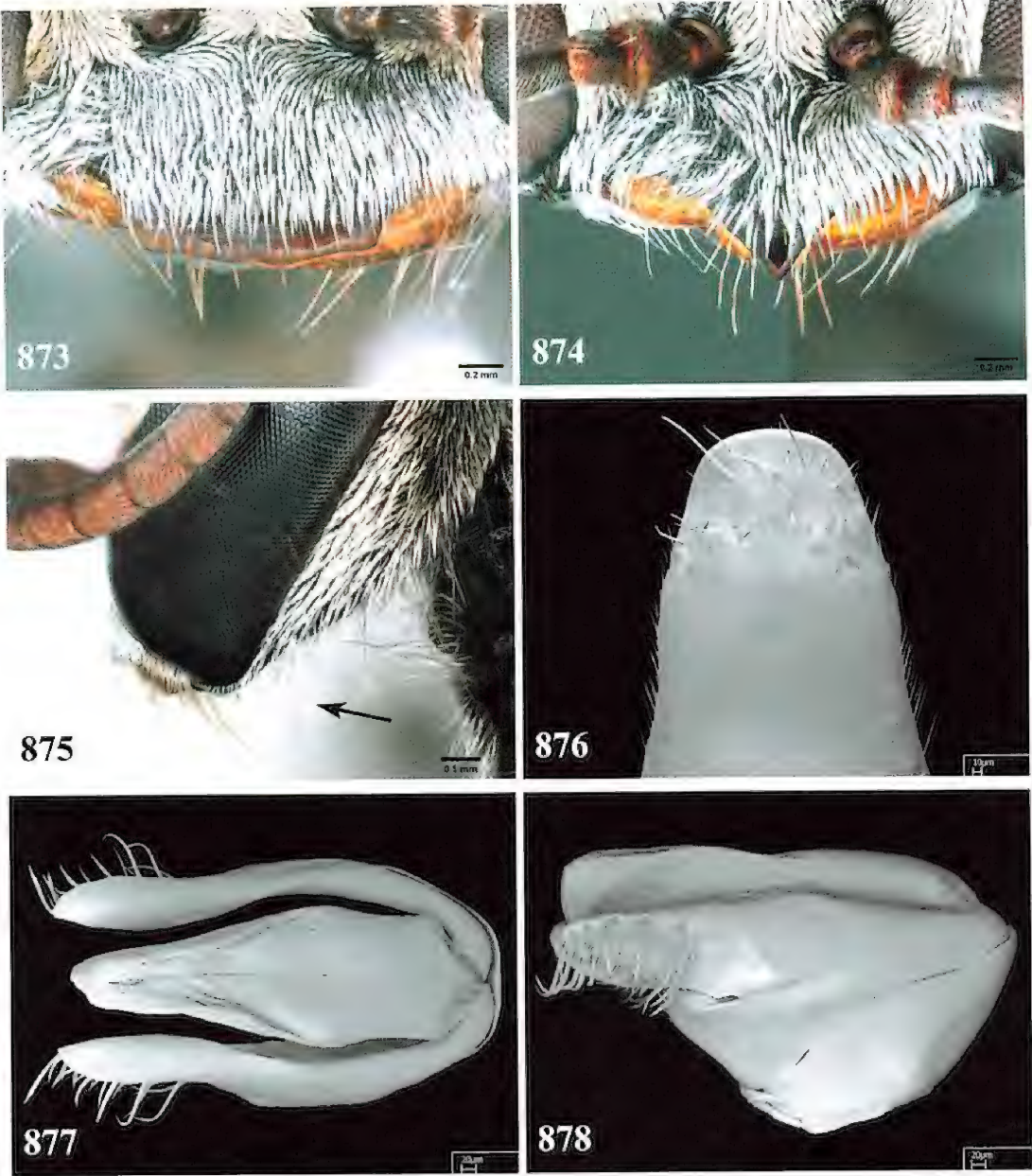
**NAME DERIVATION.**—*Psammophilos* derives from two Greek words, ψάμμος, *sand*, and φίλος, *a friend, lover*, a noun in apposition to the generic name; an allusion to the presumed habit of nesting in sand (as suggested by the presence of the psammophores in the female).

**RECOGNITION.**—*Pison psammophilos* has a black body (mandible yellowish brown mesally, flagellum and tarsi brown in some specimens), three submarginal cells, the second recurrent vein interstitial with second intersubmarginal vein or nearly so, and setae silvery, appressed on tergum I.

The female is characterized by the lower gena impunctate and glabrous on each side of the oral fossa and the presence of a psammophore on the mandible, lower gena, and forefemur. The clypeal lamella has an obtuse lateral corner and the distance between the corners is  $1.3 \times$  as great as the distance between a corner and the adjacent orbit. Several species are similar, but *P. psammophilos* differs in having sternum II apicomesally and sterna III and IV mesally sparsely punctate, with punctures many diameters apart. In the other species, the punctures are no more than 2-3 diameters apart, except somewhat sparser in *occidentale*. In that species, however, several punctures on the scutal disk behind center are more than one diameter apart, the propodeal dorsum, side and posterior surface are punctate, without well-defined ridges, and the propleuron is sparsely punctate anteriorly. In *psammophilos*, all scutal punctures are less than one diameter apart, the propodeum is ridged, and the propleuron is densely punctate.

The male of *psammophilos* has an acutely angulate clypeal lamella and sternum VIII rounded apically (Fig. 876), without posterolateral angles, and the scutal punctures compressed against each other, with linear interspaces (rather than non-compressed, with nonlinear interspaces). This character combination is shared with *P. ciliatum* (in which the ocellocular distance equals  $1.7-1.8 \times$  hindocellar diameter, the setae of the lower gena are curved and subappressed, the sterna are densely, uniformly punctate, and the legs are ferruginous). In *P. psammophilos*, the ocellocular distance equals  $0.9-1.2 \times$  hindocellar diameter, the setae of the lower gena are sinuous and erect, the punctures of sternum II apicomesally and of sterna III and IV (except laterally) are several diameters apart, and the legs are black or the tibiae are dark ferruginous.

**DESCRIPTION.**—Frons dull, largely concealed by vestiture in fresh specimens, punctures compressed against each other, middle supraantennal carina short, about as long as midocellar diameter. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, compressed against each other (interspaces linear). Tegula enlarged, in most males with one row of punctures along its inner margin that extends to the tegula apex; males from Queensland have several such rows (the combined width of rows about half width of tegula). Mesopleural punctures well defined, less than one diameter apart (many interspaces linear). Postspiracular carina present, about half as long as midocellar diameter or slightly longer. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum rugose or longitudinally ridged except laterally; side irregularly, coarsely ridged, punctate between ridges; posterior surface irregularly, transversely ridged mesally, rugose laterally. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I averaging less than one diameter apart on



FIGURES 873-878. *Pison psammophilos* Pulawski, sp. nov. (873) Female clypeus; (874) Male clypeus; (875) Female gena (arrow shows psammophore); male: (876) Sternum VIII (ventral surface); (877) Genitalia in dorsal view; (878) Genitalia in lateral view.



horizontal part. Sternum II apicomesally and sterna III and IV (except laterally) sparsely punctate, many diameters apart in female, several diameters apart in male.

Setae silvery, appressed on frons, strictly appressed on scutum and tergum I; oriented ventrally in lower half of frons, oriented dorsally in upper half of frons, oriented radially around midocellus (setae of lower and upper frons divided by well defined partition); completely concealing integument on clypeus (except lamella); see below for setae of lower gena. Apical depressions of terga with silvery, setal fasciae.

Body black, mandible yellowish brown (black basally, brown apically), flagellum brown to black, tarsi black to brown; tibiae dark ferruginous in specimens from Hann River, Queensland.

♀.—Upper interocular distance equal to  $0.58\text{--}0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $0.96\text{--}1.0 \times$  distance between eye notches. Clypeal lamella with lateral corner, distance between corners  $1.3 \times$  distance between corner and adjacent orbit, free margin of lamella broadly arcuate (Fig. 873). Dorsal length of flagellomere I  $1.9\text{--}2.0 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width. Lower gena (Fig. 875), mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.7\text{--}1.0 \times$ ,  $0.7\text{--}1.0 \times$ , and  $0.8\text{--}1.0 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophore. Mandible: trimmal carina with small incision at about two thirds of length. Length 6.3–6.9 mm; head width 2.0–2.2 mm.

♂.—Upper interocular distance equal to  $0.80\text{--}0.86 \times$  lower interocular distance; ocellocular distance equal to  $0.9\text{--}1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $0.98\text{--}1.06 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 874). Dorsal length of flagellomere I  $1.6\text{--}1.8 \times$  apical width, of flagellomere X  $0.7\text{--}0.8 \times$  apical width. Setae of lower gena suberect, slightly sinuous, longest ones slightly longer than midocellar diameter. Sternum VIII with glabrous swelling basally, its apical margin rounded, without apicolateral corner (Fig. 876). Genitalia: Figs. 877, 878. Length 5.3–5.9 mm; head width 1.6–1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 879).—Northern parts of Northern Territory, of Queensland, and of Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: **Northern Territory:** Keep River National Park at  $15^{\circ}47'49''\text{S}$   $29^{\circ}06'31''\text{E}$ , 31 May – 3 June 2001, T. Weir, K. Pullen, and P. Bouchard (ANIC).

**PARATYPES:** AUSTRALIA: **Northern Territory:** Keep River National Park at  $15^{\circ}45'30''\text{S}$   $129^{\circ}06'28''\text{E}$ , 6–9 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC), at  $15^{\circ}45'44''\text{S}$   $129^{\circ}05'55''\text{E}$ , F.D. Parker and M.E. Irwin, 8 June 2001 (2 ♂, CAS) and 9 June 2001 (1 ♂, CAS), at  $15^{\circ}47'49''\text{S}$   $129^{\circ}06'31''\text{E}$ , C. Lambkin, F.D. Parker, and M.E. Irwin, 3–6 June 2001 (2 ♀, 3 ♂, ANIC; 3 ♀, 1 ♂, CAS), 6–8 June 2001 (1 ♂, CAS), and 8–10 June 2001 (1 ♂, ANIC), at  $15^{\circ}57'33''\text{S}$   $129^{\circ}01'44''\text{E}$ , 3–8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), at  $15^{\circ}57'55''\text{S}$   $129^{\circ}01'52''\text{E}$ , 3–8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC; 1 ♀, 1 ♂, CAS) and 9 June 2001 (1 ♀, CAS); Victoria Highway 38.5 km SW Timber Creek at  $15^{\circ}42'40''\text{S}$   $130^{\circ}07'48''\text{E}$ , M.E. Irwin, F.D. Parker, and C. Lambkin, 6–13 June 2001 (2 ♀, CAS), 13–19 June 2001 (2 ♀, CAS), and 15–19 June 2001 (4 ♂, CAS). **Queensland:** Hann River at  $15^{\circ}11'\text{S}$   $143^{\circ}52'\text{E}$ , 17 Aug



FIGURE 879. Collecting localities of *Pison psammophilos* Pulawski, sp. nov.

– 15 Sept 1003, P. Zborowski and S. Shattuck (1 ♂, ANIC; 1 ♂, CAS). **Western Australia:** Carson escarpment at 14°49'S 126°49'E, 9-15 Aug 1975, I.F.B. Comon and M.S. Upton (1 ♂, ANIC).

***Pison pseudociliatum* Pulawski, species nova**

Figures 880-885.

**NAME DERIVATION.**— *Pseudociliatum* is derived from the species name *ciliatum* and the prefix *pseudo-* (from Greek *ψευδής*, *lying, false*), indicating its visual similarity to that species.

**RECOGNITION.**— The male of *P. pseudociliatum* (the female is unknown) resembles *P. ciliatum* in sharing the unique combination of an apically rounded sternum VIII, without posterolateral angles (Fig. 881), setae appressed on tergum I, an all black gaster, and ferruginous tibiae and tarsi. It differs from *P. ciliatum* in having the scutal and mesopleural punctures separated by narrow gaps (compressed against each other in *P. ciliatum*), the upper interocular distance equal to the lower interocular distance (Fig. 880) rather than to  $0.84\text{--}0.86 \times$  lower interocular distance, the ocellocular distance equal to  $2.3\text{--}2.5 \times$  hindocellar diameter (rather than  $1.7\text{--}1.8 \times$  hindocellar diameter), sterna III-VI unsculptured and shiny preapically (rather than uniformly punctate), and the body length  $8.6\text{--}10.5$  mm (rather than  $5.6\text{--}5.8$  mm).

**DESCRIPTION.**— Frons dull, punctate, punctures less than one diameter apart. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Propleuron sparsely punctate. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, mostly less than one diameter apart, but those behind center about one diameter apart; interspaces with widely spaced microscopic punctures. Tegula enlarged. Mesopleural punctures mostly less than one diameter apart, but a few about one diameter apart. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (punctures nearly compressed against each other); side minimally concave, punctate (punctures less than one diameter apart), interspaces merging into small ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface closely punctate. Punctures of tergum I less than one diameter apart on horizontal portion. Most punctures of sternum II less than one diameter apart, but those anterolaterally on apical depression several diameters apart.

Setae silvery, appressed on upper frons, postocellar area, scutum, and tergum I; largely concealing integument on clypeus; on lower gena mostly appressed, but near hypostomal carina suberect, curved apically, about as long as  $0.5 \times$  midocellar diameter. Apical depressions of terga (including tergum II) with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, mandible dark reddish brown apically, apical depressions of terga brown. Forefemur black ferruginous apically, midfemur ferruginous ventrally and apically, black dorsally, hindfemur, tibiae, and tarsi ferruginous.

♀.— Unknown.

♂.— Upper interocular distance equal to  $1.00 \times$  lower interocular distance (Fig. 880); ocellocular distance equal to  $2.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.6 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 880). Dorsal length of flagellomere I  $2.0\text{--}2.2 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Mandible with rudimentary abductor ridge. Sterna III-VI unsculptured, shiny anterior of apical depression, sternum VIII rounded apically (Fig. 881), in lateral view: Fig. 882. Genitalia: Figs. 883, 884. Length  $8.6\text{--}10.5$  mm; head width  $2.5\text{--}2.8$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 885).— Known from two localities in Western Australia.



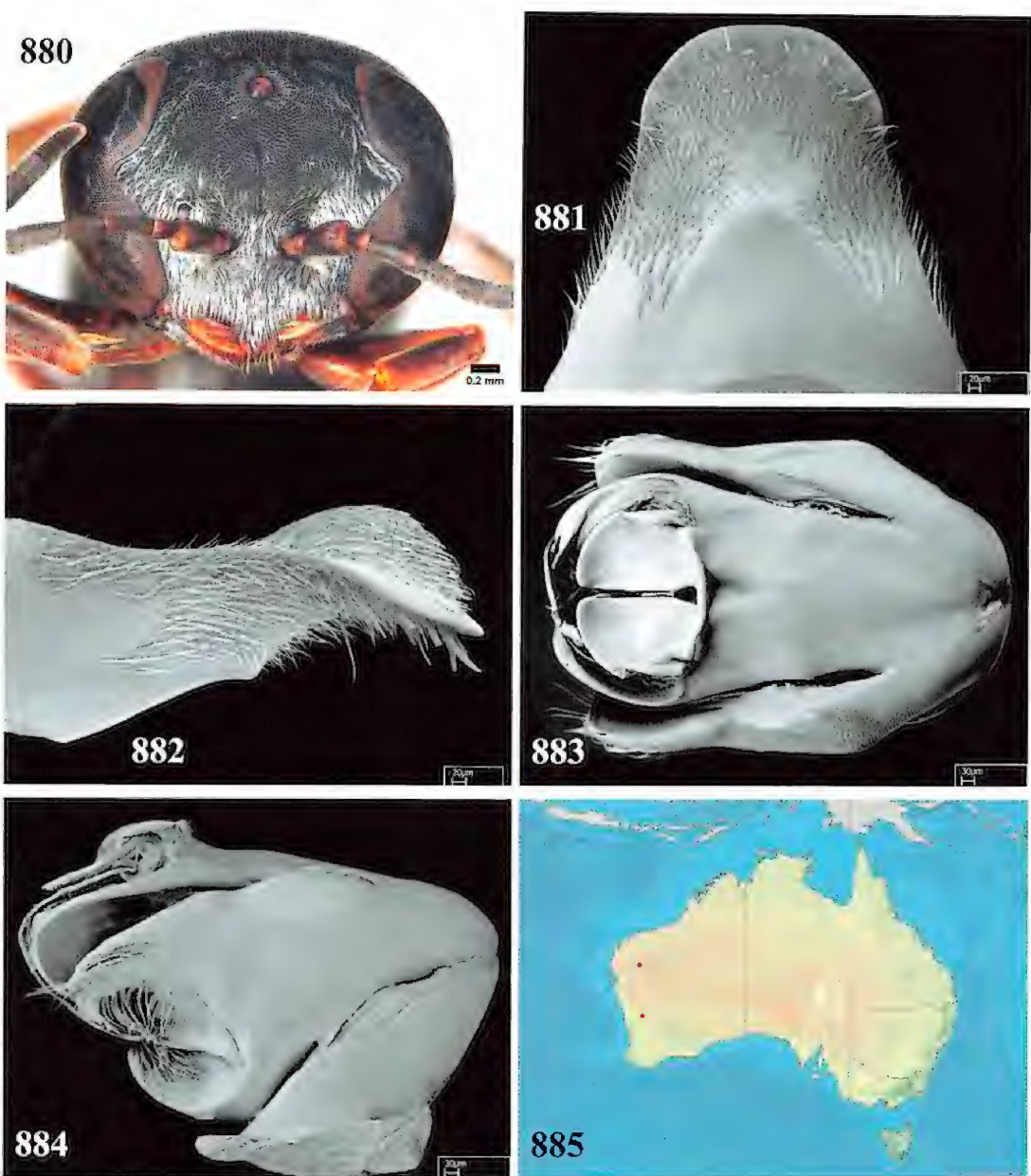


FIGURE 880-884. *Pison pseudociliatum* Pulawski, sp. nov., male. (880) Head in frontal view; (881) Sternum VIII (ventral surface); (882) Sternum VIII in lateral view; (883) Genitalia in dorsal view; (884) Genitalia in lateral view.  
FIGURE 885. Collecting localities of *Pison pseudociliatum* Pulawski, sp. nov.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: Western Australia: Mount Gibson Station, 26 Feb 2000, S.R. Patterson (WAM).

PARATYPES: AUSTRALIA: Western Australia: Mount Augustus National Park, M.E. Irwin and F.D. Parker, at 24°18.0'S 116°47.6'E, 25 Apr – 7 May 2003 (1 ♂, CAS) and at 24°21.7'S 116°50.2'E, 7-9 May 2003 (1 ♂, ANIC).

*Pison pumilio* Pulawski, species nova

Figures 886-891.

**NAME DERIVATION.**— *Pumilio*, Latin for *dwarf*; a noun in apposition to the generic name; with reference to this species small size.

**RECOGNITION.**— *Pison pumilio* is an all black species with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and setae appressed on tergum I. The female is unknown, and the male is characterized by sternum VIII with the apical margin minimally convex to minimally concave, not emarginate, with minute apicolateral corner (Fig. 888), in combination with the tegula all finely punctate except narrowly impunctate near apex (Fig. 887), and the propodeal dorsum finely rugose. Subsidiary diagnostic characters are the following: ocellocular distance equal to  $0.8\text{--}1.1 \times$  hindocellar diameter, clypeal lamella acutely angulate (Fig. 886), sternal punctures averaging about one diameter apart, sternal setae appressed, length 4.0-4.8 mm.

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart, middle supraantennal carina absent or evanescent. Occipital carina joining hypostomal carina. Gena moderately narrow in dorsal view. Labrum emarginate. Anteromedian pronotal pit rounded, about as wide as  $0.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures less than one diameter apart (Fig. 887). Tegula not enlarged, finely punctate throughout (except narrowly impunctate near apex). Mesopleural punctures nearly contiguous. Postspiracular carina ill defined, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with ill-defined, irregular, longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, irregularly rugose; side finely ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges, with several ridges radiating up from transverse carina just above gastropodeal articulation. Posteroventral forefemoral surface minutely, closely punctate. Hindcoxal dorsum with outer margin sharply carinate apically. Punctures of tergum I less than one diameter apart or some punctures, anterior of apical depression, one diameter apart. Sterna punctate throughout.

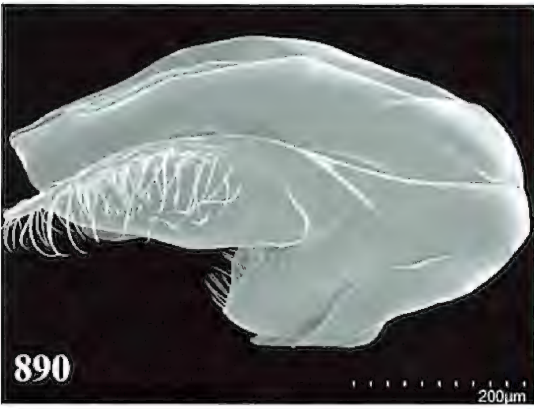
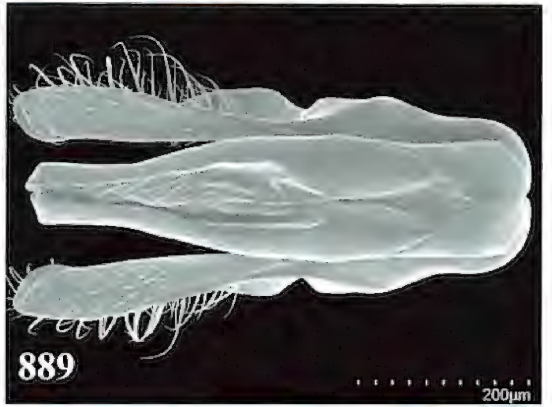
Setae silvery, appressed on postocellar area, scutum, and tergum I; oriented ventrally on whole frons or forming pair of patches of laterally oriented setae slightly below midocellus; on lower gena, suberect, up to one midocellar diameter long, completely concealing integument on clypeus except on lamella. Apical depressions of terga with silvery setal fasciae.

Body all black.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.88\text{--}0.90 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.5 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 886). Dorsal length of flagellomere I  $1.6\text{--}1.7 \times$  apical width, of flagellomere X  $0.9\text{--}1.0 \times$  apical width. Sternum VIII with apical margin straight or minimally concave (Fig. 888). Genitalia: Figs. 889, 890. Length 4.0-4.8 mm; head width 1.5-1.6 mm.





FIGURES 886-890. *Pison pumilio* Pulawski, sp. nov., male. (886) Clypeus and mandibles; (887) Tegula and adjacent scutum; (888) Sternum VIII (ventral surface); (889) Genitalia in dorsal view; (890) Genitalia in lateral view.

FIGURE 891. Collecting localities of *Pison pumilio* Pulawski, sp. nov.

**GEOGRAPHIC DISTRIBUTION** (Fig. 891).— Northern parts of Northern Territory and of Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: Western Australia: 47 km S Pardoo Roadhouse at 20°22'7"S 120°01'3"E, 1-14 May 2003, M.E. Irwin and F.D. Parker (ANIC).

PARATYPES: AUSTRALIA: Northern Territory: Gregory National Park at 16°03'01"S 130°24'0.7"E, 9-20 June 2001, M.E. Irwin and F.D. Parker (1 ♂, CAS). Western Australia: same data as holotype (1 ♂, ANIC; 1 ♂, CAS).

***Pison punctatum* Pulawski, species nova**

Figures 892-899.

**NAME DERIVATION.**— *Punctatum* is a Latin neuter adjective meaning *punctate*; with reference to the punctate tegula of this species.

**RECOGNITION.**— The female of *P. punctatum* shares with several other species the presence of a psammophore on the lower gena, mandibular posterior margin, and forefemoral venter, and the lower gena unsculptured and asetose between the oral fossa and the psammophore. It differs from the other such species in having the brownish red gaster (at least terga I-III), rather than all black.

The male of *P. punctatum* is characterized by the apically rounded sternum VIII, without posterolateral angles (Fig. 896). Unlike other species with such sternum VIII, it is characterized by the red gaster (at least terga I and II) rather than all black.

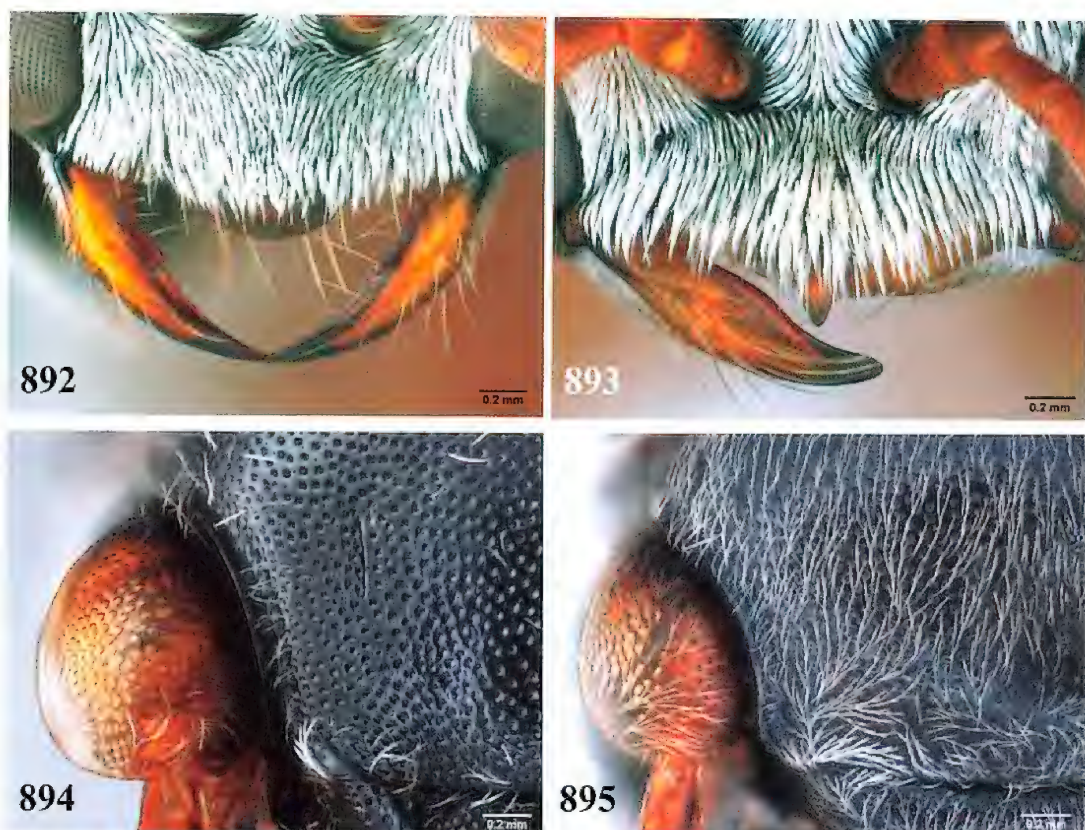
In addition, in most females and most males the tegula is completely punctate, rather than largely impunctate.

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Propleuron sparsely punctate except posteriorly, most punctures many diameters apart. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures small but well defined, varying from more to less than one diameter apart (Figs. 894, 895). Tegula enlarged but not extending beyond posterior margin of scutum, punctate throughout except for impunctate narrow marginal rim (Fig. 894) in most specimens, or impunctate at center, or impunctate at center and near external margin (Fig. 895), or with impunctate area extending from center to external margin; many or most punctures well defined, about as large as those on scutum. Mesopleural punctures compressed against each other or nearly so. Postspiracular carina present, about half as long as midocellar diameter. Metapleural sulcus costulate or not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent in most specimens); dorsum punctate (punctures compressed against each other); side and posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface finely, closely punctate. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I fine, about one diameter apart (minute, less than one diameter apart on apical depression). Sternum II punctate throughout, punctures microscopic (many diameters apart) to moderately large (2-3 diameters apart mesally).

Setae silvery, appressed on frons, scutum, and tergum I; oriented all ventrally on frons in specimens from Western Australia, oriented dorsally above middle carina and laterally next to midocellus in most specimens from South Australia; completely concealing integument on clypeus; suberect on lower gena in male, about  $1.0-1.5 \times$  as long as midocellar diameter (see below for female). Apical depressions of terga with silvery, setal fasciae.

Head black; flagellum brown ventrally and black dorsally to ferruginous, darkened dorsally,

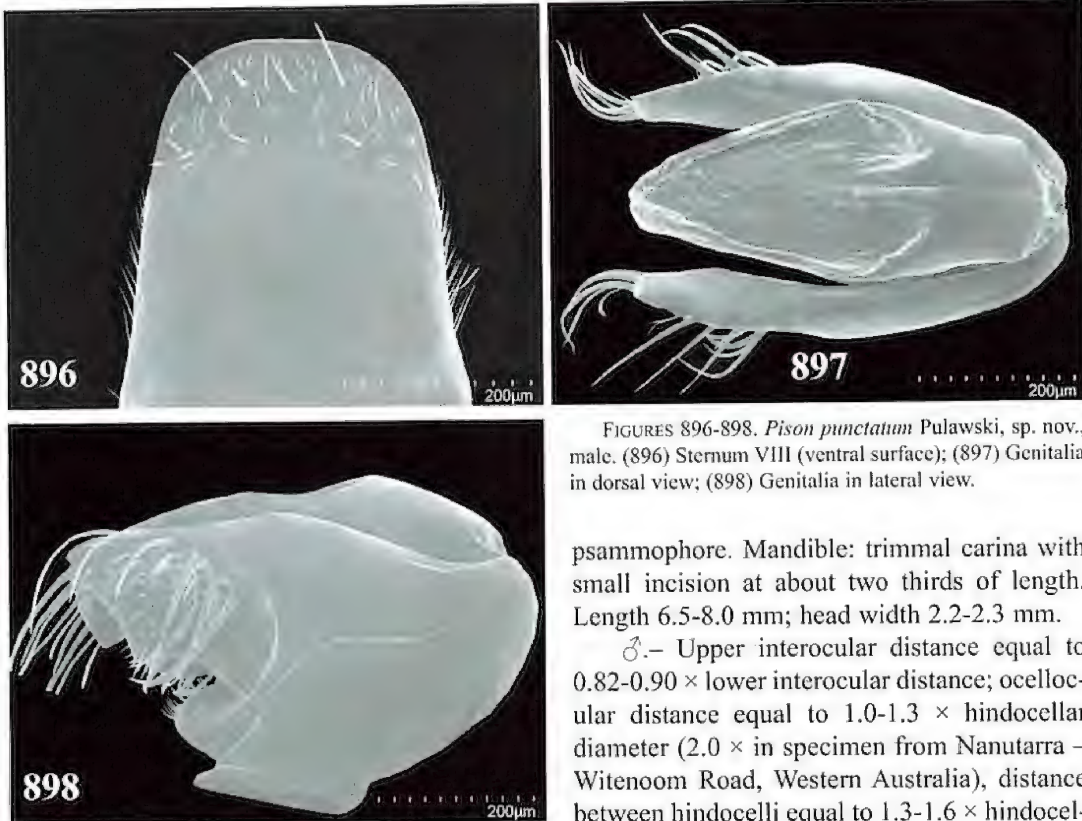




FIGURES 892-895. *Pison punctatum* Pulawski, sp. nov. (892) Female clypeus and mandibles; (893) Male clypeus and mandible; (894) Female fully punctate tegula and adjacent scutum (scutal setae lost); (895) Female partly impunctate tegula and adjacent scutum.

and apical flagellomere black; mandible mostly yellowish brown, black basally, brown to black apically. Thorax and propodeum black in most specimens, but the following are reddish in single female from Nanutarra-Wittenoom Road, Western Australia: pronotum, mesopleuron, mesothoracic venter, postscutellum laterally, and propodeum, and in a male from Hamersley Station, Western Australia: mesopleuron, mesothoracic venter, postscutellum laterally, propodeal side, and propodeal posterior surface mesally. Legs all ferruginous or (specimens from West McDonnell National Park, Northern Territory, and Peebinga Conservation Park, South Australia) forefemur and in some specimens midfemur black, and only tibiae and tarsi ferruginous in single male from Mount Davies, and one from Musgrave Range, both South Australia. Gaster all ferruginous or (in specimens from West MacDonnell National Park) only terga I-III ferruginous, and only terga I and II ferruginous in male from Mount Davies and that from Musgrave Range.

♀.— Upper interocular distance equal to  $0.62\text{--}0.72 \times$  lower interocular distance; ocellocular distance equal to  $0.7\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.96\text{--}0.98 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 892) to nearly truncate. Dorsal length of flagellomere I  $1.9\text{--}2.1 \times$  apical width, of flagellomere IX  $1.0\text{--}1.2 \times$  apical width. Lower gena, mandibular posterior margin, propleural outer margin, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.8\text{--}1.2 \times$ ,  $0.8 \times$ , and  $0.6\text{--}0.8 \times$ , respectively, of greatest forefemoral width); lower gena shiny, impunctate and asetose between oral fossa and



FIGURES 896-898. *Pison punctatum* Pulawski, sp. nov., male. (896) Sternum VIII (ventral surface); (897) Genitalia in dorsal view; (898) Genitalia in lateral view.

psammophore. Mandible: trimmal carina with small incision at about two thirds of length. Length 6.5-8.0 mm; head width 2.2-2.3 mm.

♂.— Upper interocular distance equal to 0.82-0.90 × lower interocular distance; ocellocular distance equal to 1.0-1.3 × hindocellar diameter (2.0 × in specimen from Nanutarra – Witenoom Road, Western Australia), distance between hindocelli equal to 1.3-1.6 × hindocel-

lar diameter (2.0 × in specimen from Nanutarra – Witenoom Road); eye height equal to 0.94-0.96 × distance between eye notches (0.88 × in specimen from Nanutarra – Witenoom Road). Free margin of clypeal lamella acutely angulate (Fig. 893). Dorsal length of flagellomere I 1.6-1.8 × apical width, of flagellomere X 1.2 × apical width. Apical margin of sternum VIII rounded (Fig. 896). Genitalia: Figs. 897, 898). Length 5.6-6.8 mm; head width 1.7-2.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 899).— Northern Territory, South Australia, Western Australia.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: South Australia: 31 km NW Renmark at 33°59'S 140°30'E, 23 Jan – 21 Feb 1996, K.R. Pullen (ANIC).

**PARATYPES:** AUSTRALIA: Northern Territory: West MacDonnell National Park ca 3 km W Road to Simpson Gap at 23°41.8'S 133°41.7'E, Ch.M. Palmer, 27 Jan – 27 Feb 2007 (3 ♀, NTM), 27 Feb – 27 Mar 2007 (1 ♀, NTM), 27 Sept – 27 Oct 2007 (2 ♀, 1 ♂, CAS; 3 ♀, 1 ♂, NTM), 27 Oct – 27 Nov 2007 (2 ♀, CAS; 2 ♀, NTM), 27 Nov – 27 Dec 2007 (3 ♀, CAS; 2 ♀, 1 ♂, NTM), 27 Dec 2007 – 27 Jan 2008 (1 ♀, CAS; 1 ♀, NTM). South Australia: Brookfield Conservation Park at 34°19'S 139°30'E, J. Stelman and S. Williams, 2 Dec 1991 – 2 Jan 1992 (1 ♀, ANIC; 2 ♀, CAS), 4-20 Feb 1992 (1 ♀,



FIGURE 899. Collecting localities of *Pison punctatum* Pulawski, sp. nov



ANIC); Mount Davies and vicinity in Tompkinson Ranges, 18-21 Oct 1972, H.E. Evans (1 ♂, ANIC); 10 km NNE Mount Woodruffe in Musgrave Ranges at 26°14'55"S 131°47'36"E, 13-17 Oct 1994, Pitjantjatjara Lands Survey (1 ♂, SAM); Peebinga Conservation Park 42 km N Pinnaroo at 34°59.3'S 140°46.9'E, 11 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 14 km WNW Renmark at 34°07'S 140°37'E, 13 Dec 1995 – 25 Jan 1996, K.R. Pullen (3 ♀, ANIC); 31 km NW Renmark at 33°59'S 140°30'E, 1-30 Mar 1995, K.R. Pullen (ANIC). **Western Australia:** Brockman Creek 11 km E Marble Bar at 21°09.0'S 119°51.7'E, 2-14 May 2003, M.E. Irwin and F.D. Parker (2 ♀, ANIC); 176 km E Fitzroy Crossing at Highway 1, 25 Nov 1983, E.I. Schlinger and M.E. Irwin (1 ♀, CAS); Hamersley Station at 22°18'6"S 117°41'35"E, 18-23 Nov 2004, CVA [= Conservation Volunteers Australia] (1 ♂, AMS) and at 22°29'10"S 117°41'28"E, 16-20 Feb 2005, M. Bulbert and S. Ginn (1 ♂, AMS) and 3-8 Jan 2006, A. Donnelly and CVA [= Conservation Volunteers Australia] (1 ♀, AMS); Juna Downs Station, CVA volunteers: at 22°51'36"S 118°42'19"E, 28 Oct – 2 Nov 2005 (1 ♂, AMS) and 18-23 Nov 2004 (2 ♂, AMS; 2 ♂, CAS), and at 22°51'30"S 118°40'14"E, 19-24 Nov 2004 (1 ♂, AMS) and 3-8 Jan 2006 (1 ♂, AMS); Nanutarra-Wittenoom road at 22°21'21"S 117°54'16"E, 30 Sept – 5 Oct 2004, CVA [= Conservation Volunteers Australia] (1 ♀, AMS) and 22°26'36"S 117°48'13"E, 16-20 Feb 2005, M. Bulbert and S. Ginn (1 ♂, AMS); 47 km S Pardoo Road House at 20°22.7'S 120°01.3'E, 1-14 May 2003, M.E. Irwin and F.D. Parker (1 ♂, ANIC; 1 ♂, CAS; 1 ♂, CAS); 60 km N Tom Price at 22°18.8'S 117°40.5'E, M.E. Irwin and F.D. Parker, 20 Apr 2003 (2 ♂, ANIC; 1 ♀, CAS) and 20 Apr – 4 May 2003 (1 ♀, CAS).

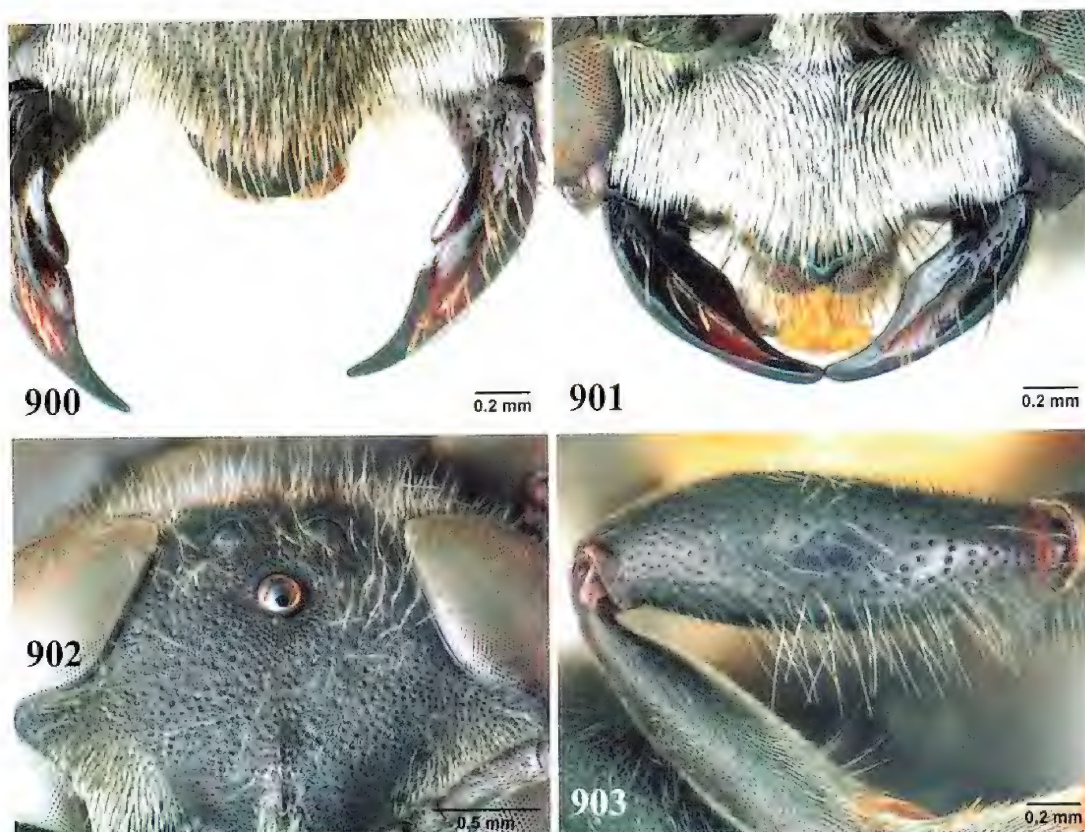
***Pison punctifemur* Pulawski, species nova**

Figures 900-907.

**NAME DERIVATION.**— *Punctifemur* is derived from two Latin words: *punctum*, a puncture, and *femur*, a femur; a noun in apposition to the generic name; with reference to the conspicuously punctate forefemoral venter.

**RECOGNITION.**— *Pison punctifemur* has a black gaster (with brown apical depressions of terga and golden setal fasciae), three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and setae appressed on tergum I. It has a unique combination of the conspicuous punctures on the upper frons, many of which are 2-3 diameters apart (Fig. 902) and of the conspicuously large punctures on the posteroventral surface of the forefemur (Fig. 903); the femoral punctures are shared with *P. hirsutum*. Unlike *P. hirsutum*, the lower gena of *P. punctifemur* is punctate and setose adjacent to the oral fossa (rather than nearly impunctate and asetose), the scutal punctures are no more than one diameter apart, with shiny interspaces (rather than about 2-3 diameters apart, with markedly dull interspaces), and the mesopleural punctures are less than one diameter apart (rather than more than one diameter apart near the center); also, the tergal setae of *P. hirsutum* are silvery.

**DESCRIPTION.**— Frons dull, punctate, many punctures of upper frons 2-3 diameters apart. Labrum minimally emarginate. Anteromedian pronotal pit transversely elongate, about as long as 1.5 × midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, most punctures about one diameter apart, other punctures less than one diameter apart; interspaces unsculptured. Tegula slightly enlarged. Mesopleural punctures larger than those on scutum, less than one diameter apart, up to about one diameter apart ventrally; interspaces aciculate at least in ventral half. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, with or without median shallow sulcus; side ridged, punctate between ridges; posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface with conspicuous punctures up to several diameters apart. Hindcoxal dorsum with outer margin not carinate. Punctures of



FIGURES 900-903. *Pison punctifemur* Pulawski, sp. nov. (900) Female clypeus; (901) Male clypeus; (902) Female frons; (903) Female forefemur (posteroventral surface).

tergum I about 1-2 diameters apart on horizontal part (less than one diameter apart adjacent to apical depression). Sternum II punctate throughout.

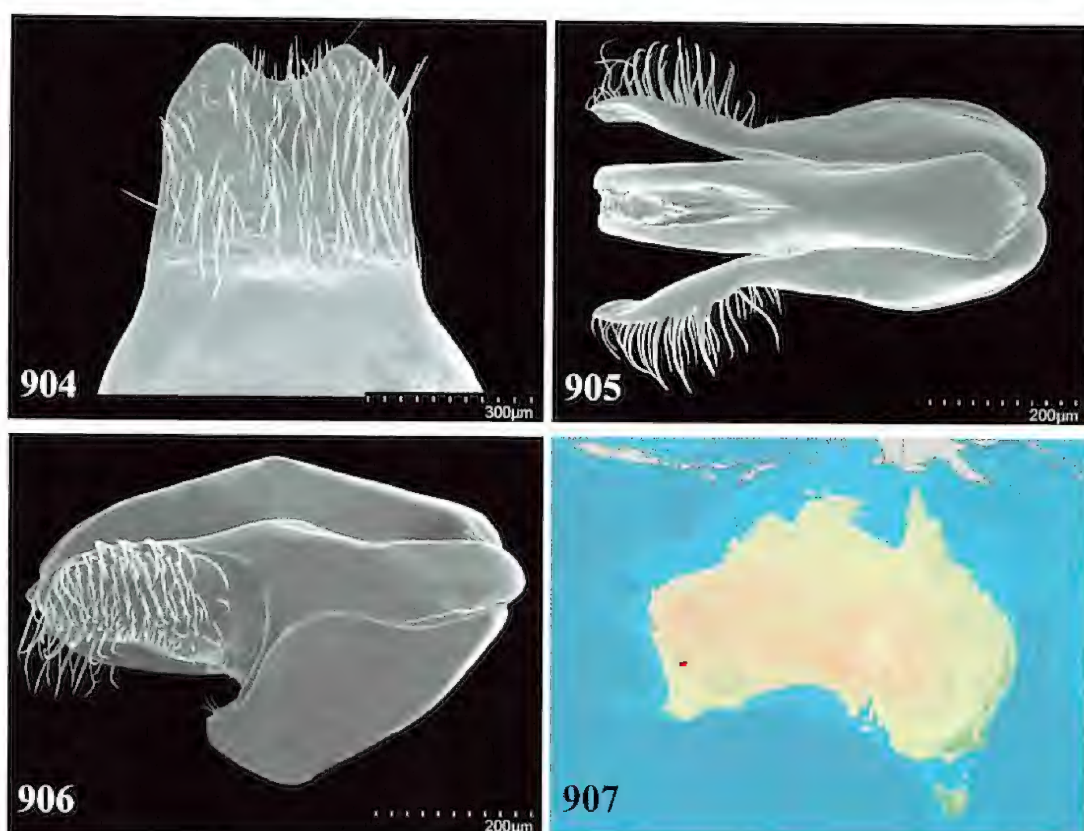
Setae silvery, erect on upper frons, gena (slightly sinuous, almost straight), thorax, forecoxal venter, and femoral venters; appressed on tergum I; setal length  $1.5-1.0 \times$  midocellar diameter on upper frons,  $0.5-1.0 \times$  on scutum,  $2.0 \times$  on gena; not concealing integument on clypeus in female, concealing in male. Apical depressions of terga with golden setal fasciae.

Body black, mandible all black or brown mesally, apical depressions of terga brown, tibiae ferruginous basally in some males.

♀.— Upper interocular distance equal to  $0.72-0.74 \times$  lower interocular distance; ocellocular distance equal to  $1.1-1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $0.92-1.04 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 900). Dorsal length of flagellomere I  $2.5-2.6 \times$  apical width, of flagellomere IX  $1.2-1.3 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 10.2-10.5 mm; head width 2.9-3.1 mm.

♂.— Upper interocular distance equal to  $0.86-0.90 \times$  lower interocular distance; ocellocular distance equal to  $1.8-2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.5 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate, its lateral margin slightly concave in most specimens (Fig. 901). Dorsal length of flagellomere I  $2.4-2.8 \times$  apical width, of flagellomere X  $1.1-1.2 \times$  apical width.





FIGURES 904-906. *Pison punctifemur* Pulawski, sp. nov., male. (904) Sternum VIII (ventral surface); (905) Genitalia in dorsal view; (906) Genitalia in lateral view.

FIGURE 907. Collecting localities of *Pison punctifemur* Pulawski, sp. nov.

Sternum VIII emarginate apically (Fig. 904). Genitalia: Figs. 905, 906. Length 8.9-11.2 mm; head width 2.7-3.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 907).— Western Australia.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: **Western Australia**: 60 km NE Wubin at 29°43'S 117°04'E, 27 Sept 1981, I.D. Naumann and J.C. Cardale (ANIC).

PARATYPES: AUSTRALIA: **Western Australia**: Mount Gibson Station at 29°36'52"S 117°24'38"E, 25 Sept 2001, S.R. Paterson (1 ♂, WAM); Mount Gibson Station 93 km NE Wubin at 29°41.23'S 117°21.62'E, 21-29 Aug 2001, R. Leys and K. Ottewell (2 ♀, SAM); same data as holotype (5 ♀, 18 ♂, ANIC; 3 ♀, 9 ♂, CAS).

### *Pison punctifrons* Shuckard

Figures 908-921.

*Pison punctifrons* Shuckard, 1838:77, ♀. Holotype: ♀, "India or St. Helena", actually Austro-Papuan Region: no specific locality (OXUM), examined. — F. Smith, 1856:313 (in catalog of Hymenoptera in British Museum), 1869a:290 (in checklist of *Pison*); Kohl, 1885a:188 (in checklist of world *Pison*); Cameron, 1889c:118 (in checklist of Oriental *Pison*); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); D. Baker, 1998:173 (type origin and depository). **Nec following authors** (= *Pison suspiciosum*): Bingham, 1897; Turner, 1916b; Maidl, 1925; Yasumatsu, 1935, 1936, 1937; Iwata, 1939; Yasumatsu, 1939; Krombein, 1949b, 1950; Yasumatsu, 1953; Iwata and Yoshikawa, 1961; Tsuneki, 1962; Iwata, 1964b; Tano, 1964; Tsuneki, 1964; Baltazar, 1966;

- Tsuneki, 1967; Haneda, 1968a, 1968b; Tsuneki, 1968c, 1970; Haneda, 1971; Tsuneki, 1971; Yamada, 1971; Haneda, 1972; Tano, 1972; Haneda, 1973; Murota, 1973a, 1973b; Tsuneki, 1974; Nambu, 1975; Tsuneki, 1976, 1977, 1982b, 1982c, 1982d, 1983a, 1983c, 1984a; Paik, 1985; Radović, 1985; Takahashi 1993; Miyatake, 1996; Wu and Zhou, 1996a; Porter, Stange, and Wang, 1999; Yamane, Ikudome, and Terayama, 1999; Lee and Shin, 2000; Krombein and Norden, 2001; Haneda, Nosaka, Tano, Kurokawa, and Murota, 2004, 2005; Hua, 2006; Haneda, Nozaka, Tano, Kurokawa, H. Murota, and T. Murota, 2007; Terayama and Nambu, 2009; Takahashi, 2010; Haneda, 2011; T. Li, and Q. Li, 2011; Kim, 2014.
- Pison nitidum* F. Smith, 1859:160, ♀ (as *nitidus*, incorrect original termination). Lectotype: ♀, Indonesia: Maluku: Key (now Kai) Islands (OXUM), **present designation**, examined. **New synonym**.— F. Smith, 1863a:35 (Indonesia), 1863b:135 (known from islands of Misool, Key, and Aru), 1869:291 (in checklist of *Pison*), 1871:366 (in catalog of Oriental Aculeata); Maindron, 1879b:181 (Indonesia: Maluku: Ternate, redescription, as *nitidus*); Kohl, 1885:187 (in checklist of world *Pison*); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); Cameron, 1905:62 (Java, as *nitidus*); Turner, 1916b:627 (Indonesia: Aru and Ké islands, as *nitidus*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae).
- Pison morosum* F. Smith, 1865:85, ♀ (as *morosus*, incorrect original termination), junior primary homonym of *Pison morosum* F. Smith, 1856. Holotype or syntypes: ♀, New Guinea: no specific locality (BMNH). Synonymized with *Pison constrictum* by Turner, 1916b:627.
- Pison collare* Kohl, 1884:337, ♀. Lectotype: ♀, Papua New Guinea: Eastern New Britain: Duke of York Island (NHMW), **present designation**, examined. **New synonym**.— Kohl, 1885:186 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:710 (in catalog of world Hymenoptera); Turner, 1916b:627 (diagnostic characters); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Dollfus, 1989:11 (holotype in NHMW).
- Pison papuanum* W. Schulz, 1905:217. Substitute name for *Pison morosum* F. Smith, 1865. **New synonym**.— Turner, 1917:326 (valid name for *Pison constrictum*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Tsuneki, 1983:42 (in key to *Pison* of New Guinea).
- Pison constrictum* Turner, 1912:201, ♂. Holotype by monotypy: ♂, Indonesia: Western Papua (= Indonesian New Guinea): Mimika River (BMNH), examined. Synonymized with *Pison papuanum* by Turner, 1917b:326. — Turner in Turner, Meade-Waldo, and Morley, 1915:7 (Western Papua: Mimika River; redescription); Turner, 1916b:627 (almost certainly the male of *Pison morosus* F. Smith, 1865).
- Pison bismarckianum* Tsuneki, 1982:41, ♀, ♂. Holotype: ♀, Papua New Guinea: Bismarck Archipelago: New Britain: Yalom (ZMUC), examined. **New synonym**.— Tsuneki, 1983:42 (in key to *Pison* of New Guinea), 45 (New Guinea; geographic variation).
- Pison biroï* Tsuneki, 1983b:46, ♀. Holotype: ♀, Papua New Guinea: Morobe Province: Simbang (MTM), examined. **New synonym**.
- Pison huonense* Tsuneki, 1983b:48, ♀. Holotype: ♀, Papua New Guinea: Morobe Province: Satterberg, correctly Sattelberg, (MTM), paratype examined. **New synonym**.

**LECTOTYPE DESIGNATION.**— F. Smith did not provide the number of specimens examined in his description of *Pison nitidum*, but at least one female is present in the Oxford University Museum. I have designated it as the lectotype of this species.

Kohl's description of *Pison collare* does not contain the number of specimens studied. I have examined the only specimen present in the Naturhistorisches Museum, Wien, and have selected it as the lectotype of this species.

**RECOGNITION.**— *Pison punctifrons* is an all black species with three submarginal cells and erect setae on tergum I and sternum II. It shares with *P. pandambai* and *P. suspiciosum* the conspicuously coarse frontal punctures (Fig. 911), some punctures equal to  $0.4\text{--}0.6 \times$  midocellar diameter (compared to about  $0.1\text{--}0.2 \times$  in the other Australian species) and with the first species the absence of the longitudinal carina between the propodeal spiracle and the gastropodeal articulation and the hindcoxa dorsum with a conspicuous tooth at the base of the inner carina.

*Pison punctifrons* differs from the New Guinean *P. pandambai* in having the clypeal lamella



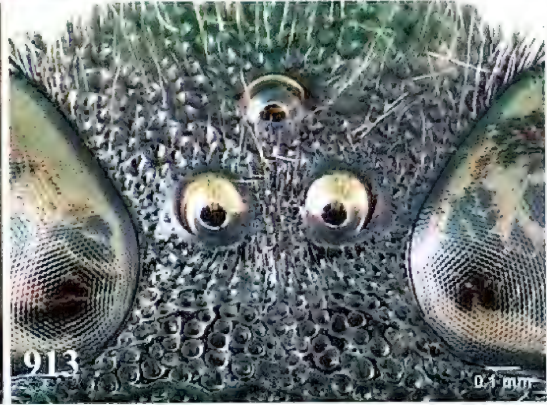
acutely to slightly obliquely angulate in the female and acutely angulate in the male (Figs. 908, 909, 910), rather than, respectively, truncate and obtusely tridentate or truncate. Unlike *P. suspiciosum*, the propodeum of *P. punctifrons* lacks the longitudinal carina separating the side from the dorsum and posterior surface (carina present in *P. suspiciosum* except rudimentary in some specimens), the hindcoxal dorsum has a prominent tooth at the base of the inner carina (tooth insignificant in *P. suspiciosum*), and male sternum VIII has a prominent median process (conspicuously emarginate apically in *P. suspiciosum*). Also, the apical depressions of tergum I is finely punctate (unsculptured mesally in most *P. suspiciosum*), and the lateral setae of tergum II are appressed (in most *P. suspiciosum* suberect, about as long as the midocellar diameter).

**INTERPRETATION OF *PISON PUNCTIFRONS*.**—The holotype of *P. punctifrons* is labeled "S. Helena? India?", as recorded in the original description. The reference to India probably prompted Bingham (1897) to include *P. punctifrons* in his revision of aculeates of British India, and Turner (1916b) to include it in his key to Indian *Pison*. Apparently neither of the two authors has seen the holotype (that I have received for study through the kindness of Dr. James E. Hogan). Unfortunately, both Bingham and Turner used the name *P. punctifrons* for a different although closely related species (*P. suspiciosum*), and they were followed by all subsequent authors. In fact, however, the holotype of *P. punctifrons* is conspecific with *P. nitidum* and its synonyms (but not *P. suspiciosum*); as the oldest name, it becomes the valid name for them. It must have been collected somewhere in the Austro-Papuan Region (the species does not occur in India).

**JUSTIFICATION OF NEW SYNONYMY.**—The holotype of *P. bismarckianum* and the lectotype of *P. collare* are clearly conspecific with the lectotype of *P. punctifrons*, and I synonymize these names.

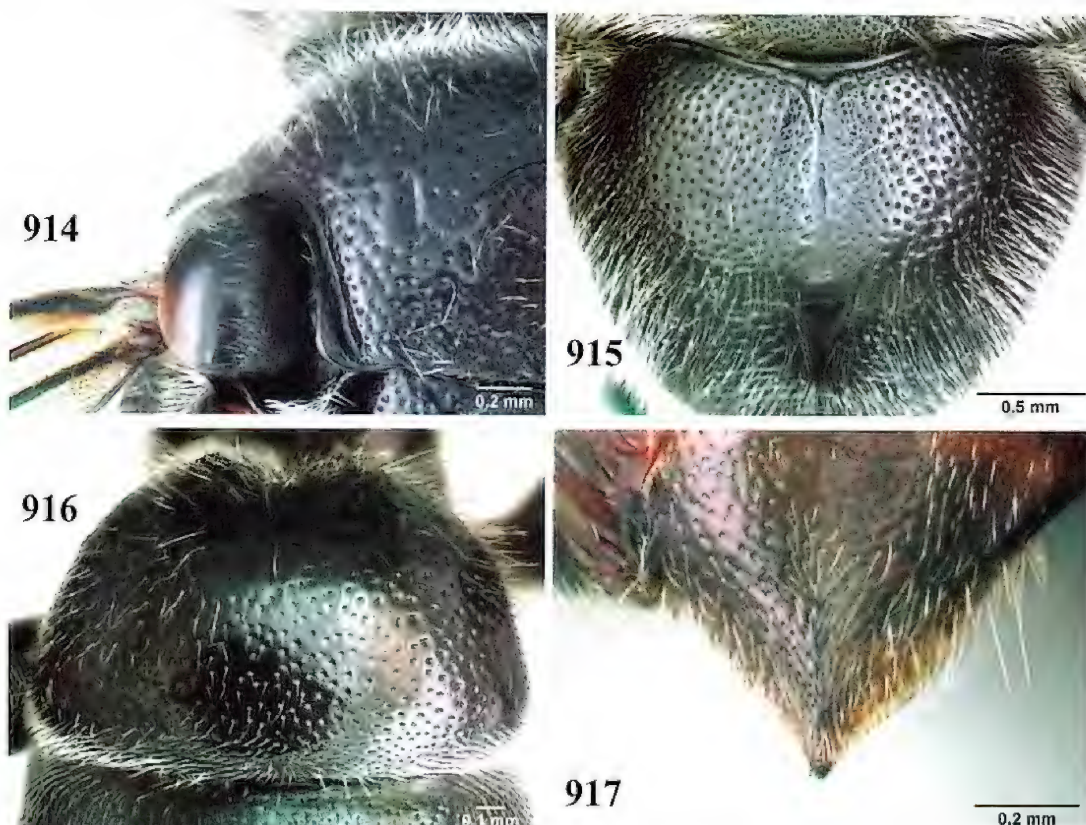
Tsuneki (1983b) differentiated his new Papuan species *P. biroi* and *P. huonense* from *P. bismarckianum* (i.e., *P. punctifrons*) first by differences in the punctuation of the clypeus, tegula, and sternum II. According to my observations, these characters are individually variable and have no value in species discrimination. The length of flagellomere I, according to the original description, is  $2.8 \times$  apical width in the holotype of *P. biroi* and  $3.3 \times$  in that of *P. huonense*, but I found no difference in this character between the two specimens. The large clypeal punctures on Tsuneki illustration of *P. huonense* are grossly exaggerated, when compared with the original specimen. The shallow median furrow on the postocellar area and the absence of the midfrontal carina in the holotype of *P. biroi* are also found in other specimens and in my opinion have no diagnostic value. In addition, the holotype of *P. biroi* originates from Simbang where a specimen of *P. punctifrons* was also collected. For these reasons, I consider *P. biroi* and *P. huonense* as synonyms of *P. punctifrons*. As a matter of fact, Tsuneki (1983b) himself suspected this synonymy, as he wrote about *P. biroi* "the present species may be a variety of *bismarckianum*" and about *P. huonense* "this species may be a variation of the preceding species or of *bismarckianum*".

**DESCRIPTION.**—Frons coarsely punctate, punctures less than one diameter apart, some of them equal to  $0.4\text{--}0.6 \times$  midocellar diameter (Fig. 911); interspaces aciculate, slightly shining; middle supraantennal carina present or absent; integument swollen above each antennal socket (swelling ill defined in smallest specimens). Occipital carina slightly expanded, its height at midlength about  $0.3 \times$  of midocellar diameter. Labrum not emarginate. Pronotal collar slightly raised apicomeresally, roundly angulate laterally, slightly concave between median elevation and lateral swelling. Antero-median pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, at most with a few ill defined, short longitudinal ridges adjacent to posterior margin; scutal punctures conspicuous, irregularly spaced, varying from several diameters apart on disk to less than one diameter apart (Fig. 914). Tegula enlarged. Mesopleural punctures conspicuous, varying from less than one diameter apart to several punctures about three diameters



FIGURES 908-913. *Pison punctifrons* Shuckard. (908) Clypeus and mandibles of female without supraantennal carina; (909) Clypeus and mandibles of female with supraantennal carina; (910) Male clypeus and mandibles; (911) Upper frons of female in frontal view showing supraantennal carina; (912) Female frons in profile showing supraantennal carina; (913) Female vertex showing positions of ocelli.





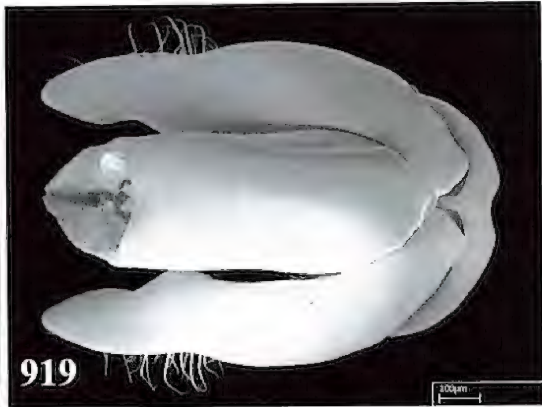
FIGURES 914-917. *Pison punctifrons* Shuckard. (914) Female tegula and adjacent scutum; (915) Propodeal dorsum of female; (916) Female tergum I; (917) Male tergum VII.

apart beneath scrobe. Postspiracular carina present, about  $3.0 \times$  as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsal and posterior surface; dorsum with series of punctures or minute transverse grooves along midline, otherwise variously sculptured: either sparsely punctate (punctures more than one diameter apart, Fig. 915), or with interspaces merging into ridges in some specimens, or ridged, densely punctate between ridges (female from Claudie River, Queensland and another from Santa Ysabel Island); side ridged, punctate between ridges, but ridges largely evanescent in specimen from New Britain; posterior surface ridged. Forecoxal venter finely, closely punctate and with larger punctures many diameters apart. Posteroventral forefemoral surface finely punctate, some punctures up to about three diameters apart. Hindcoxal dorsum with inner carina produced into conspicuous tooth basally. Punctures of tergum I well defined, minute and several diameters apart mesally. Sternum II sparsely punctate except closely punctate adjacent to lateral margin, impunctate apicomeresally.

Setae silvery, erect on head, thorax, propodeum, femoral venters, and tergum I, not concealing integument on clypeus; genal setae sinuous, longest setae of lower gena about  $1.3 \times$  basal mandibular width.

Body all black, mandible dark reddish preapically.

♀.—Upper interocular distance equal to  $0.54 \times$  lower interocular distance; ocellocular distance equal to  $0.3\text{--}0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5\text{--}0.7 \times$  hindocellar



FIGURES 918-920. *Pison punctifrons* Shuckard, male. (918) Sternum VIII (ventral surface); (919) Genitalia in dorsal view; (920) Genitalia in lateral view.

diameter (Fig. 913); eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate to slightly obliquely angulate (Figs. 908, 909). Dorsal length of flagellomere I  $2.5-2.8 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: inner margin with preapical tooth. Length 8.0-9.8 mm; head width 2.9-3.1 mm.

♂.— Upper interocular distance equal to

$0.56-0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.5-1.0 \times$  hindocellar diameter; distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter; eye height equal to  $1.00-1.06 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 910). Dorsal length of flagellomere I  $2.7 \times$  apical width, of flagellomere X  $1.1-1.2 \times$  apical width. Tergum VII compressed laterally to form an obtuse carina apicomediaally (Fig. 917). Sternum VIII with rounded apical projection (Fig. 918). Genitalia: Figs. 919, 920. Length 9.2-10.8 mm; head width 2.9-3.4 mm.

**VARIATION.**— At an early stage of this study I thought that the females of *P. punctifrons* represent two species, one, more numerous, with no carina above each antennal socket, a well-defined tooth on the trimmal carina of the mandible just above the incision (Fig. 908), and the scutum sparsely punctate, the other species with an oblique carina above each antennal socket (Fig. 912), no tooth on the trimmal carina of the mandible (Fig. 909), and the scutum densely punctate. The troubling facts were that they occurred sympatrically in several localities, and that no male was available for the second form. The subsequent study of the rich material from the Bishop Museum demonstrated, however, that intermediates exist between all these character states and that the two forms are just one species.

**GEOGRAPHIC DISTRIBUTION** (Fig. 921).— Northeastern Australia, Maluku islands, New Britain, New Guinea, Solomon Islands. Recorded from Java by Cameron (1905), but his identification is not certain.

**RECORDS.**— **AUSTRALIA: Northern Territory:** Black Point in Cobourg Peninsula at  $11^{\circ}09'S$   $132^{\circ}09'E$  (1 ♀, ANIC); Darwin: eastern suburb Berrimah (1 ♀, NTM). **Queensland:** 8 km NW Bald Hill in Ilwraith Range at  $13^{\circ}45'S$   $143^{\circ}22'E$  (3 ♀, ANIC), 11 km NW Bald Hill at  $13^{\circ}44'S$   $143^{\circ}20'E$  (23 ♀, 1 ♂, ANIC),



4 km NE Batavia Downs at 12°39'S 142°42'E (2 ♀, ANIC), 5 km S Batavia Downs at 12°41'S 142°41'E (1 ♂, ANIC), near Brisbane Forest Park at 27°26.0'S 152°55.4'E (1 ♀, CAS), Claudie River 1 mi. W (1 ♀, 1 ♂, AMS) and 5 mi. W Mount Lamond (1 ♀, AMS), Cockatoo Creek Crossing 17 km NW Heathlands at 11°39'S 142°27'E (1 ♀, ANIC), Coen at 13°57'S 143°12'E (1 ♀, ANIC; 3 ♀, CAS), Cordalba State Forest 27 km S Bundaberg (1 ♀, ANIC), Dividing Range 15 km W Captain Billy Creek (1 ♀, CA), Heathlands at 11°45'S 142°35'E (2 ♀, ANIC), 14 km ENE Heathlands at 11°41'S 142°42'E (3 ♀, 1 ♂, ANIC), 15 km ENE Heathlands at 11°41'S 142°42'E (3 ♀, ANIC), 12 km NE Heathlands at 11°43'S 142°41'E (2 ♀, ANIC), 12 km SSE Heathlands at 11°51'S 142°38'E (2 ♀, 3 ♂, ANIC), Iron Range: no specific locality (1 ♂, ANIC), Leo Creek Road 30 km NE Coen (5 ♀, 3 ♂, ANIC; 1 ♂, CAS), Lockerbie area (2 ♀, 1 ♂, ANIC), Middle Claudie River in Iron Range (2 ♀, AMS), Moreton at Wenlock River at Moreton (1 ♀, 1 ♂, ANIC), Mount Lamond in Iron Range (1 ♀, AMS), 3 km ENE Mount Tozer at 12°44'S 143°14'E (1 ♀, ANIC; 1 ♀, CAS), 9 km ENE Mount Tozer at 12°43'S 143°17'E (2 ♀, 1 ♂, ANIC), 11 km ENE Mount Tozer at 12°43'E 143°18'E (3 ♀, 1 ♂, ANIC), 3 km NE Mount Webb at 15°03'S 145°09'E (2 ♀, ANIC), 13 km SE Weipa at 12°40'S 143°00'E (2 ♀, ANIC).



FIGURE 921. Collecting localities of *Pison punctifrons* Shuckard.

**INDONESIA:** **Ambon:** Waai (1 ♀, RMNH). **Halmahera:** between Payahe and Gila Woda (4 ♀, RMNH). **Maluku:** Kai island (1 ♀, OXUM, lectotype of *Pison nitidum*), Seram (formerly Ceram): Hatumete 15 km NNE Tehoru at 3°17'S 129°39'E (2 ♀, RMNH) and 9 km E Waihai (2 ♀, RMNH), 11 km E Waihai (2 ♀, RMNH), and 21 km E Waihai (1 ♀, RMNH), Ternate (Maindron, 1879). **Western Papua** (= Indonesian New Guinea): Araucaria camp (1 ♀, 1 ♂, RMNH), Bokondini (2 ♀, BISH), Bomberi in Vogelkop Peninsula (2 ♀, BISH), 11 km S Bupul at 7°39'S 140°53'E (5 ♀, 2 ♂, RMNH), Eramboe 80 km NE from Merauke (1 ♀, BISH), Genjam 40 km W Jayapura (2 ♀, BISH, as Hollandia), Ifar (1 ♀, RMNH), Japen Island: Dawai River SSE Samberbaba (1 ♀, BISH), Mimika River (1 ♀, BMNH, holotype of *Pison constrictum*), Misool: no specific locality (1 ♀, BMNH; 1 ♂, RMNH), Nabire (1 ♀, BISH), Paniai Lakes (as Wisselmeren): Enarotadi (2 ♀, BISH), Rattan Camp (2 ♀, RMNH), Waris S Jayapura (1 ♀, BISH). **Yapen Island:** Mount Baduri (1 ♀, BMNH).

**PAPUA NEW GUINEA:** **Bougainville Province:** bush E Buin (1 ♀, CAS), Kukugai (1 ♀, BISH), Simba Mission (1 ♀, BISH). **Central Province:** Brown River (2 ♀, BISH), Cape Rodney (1 ♀, BISH), Ei Creek 30 km N Sogeri (2 ♀, RMNH), SE Mamai E Port Glasgow (1 ♀, 1 ♂, BISH), Roku (1 ♀, ANIC). **East Sepik Province:** May River (1 ♀, BISH). **Eastern Highlands Province:** Aiya (2 ♀, BISH), 22 km SE Okapa (4 ♀, BISH). **Gulf Province:** Murua River (1 ♀, BISH). **Jiwaka Province:** Tsenga in upper Jimi Valley. **Madang Province:** Baiteta 12 km NW Alexishafen at 5°00'S 145°45'E (2 ♀, CAS), Duru 15 km SW Madang at 5°20'S 145°43'E (1 ♀, CAS), Gogol River 12 km SW Madang at 5°20'S 145°42'E (6 ♀, CAS), Karkar Island at 4°35'S 145°55'E (1 ♀, RMNH), Madang (Tsuneki, 1983, as Friedrich-Wilhelmshafen), Nagada Harbor 8 km N Madang at 5°09'S 145°48'E (1 ♀, CAS), Nobonob Hill 7 km NW Madang at 5°10'S 145°45'E (2 ♀, CAS), Saidor: Sibo in Finisterre Range (1 ♀, BISH), Sapi Forest Reserve 30 km W Madang at 5°12'S 145°30'E (1 ♂, CAS), Simbai at 5°17'S 144°26'E (1 ♀, CAS), Tapo Creek 26 km SW Madang at 5°24'S 145°38'E (4 ♀, CAS), Wanuma (1 ♀, BISH). **Manus Province:** Rossum 6 km SE Lorengau (1 ♀, BISH). **Milne Bay Province:** Milne Bay (1 ♀, BISH), Woodland (= Murua) Island: Kulumadau Hill (1 ♀, BISH). **Morobe Province:** Bulldog Road (1 ♀, BISH), Bulolo River (3 ♀, BISH), 10 km S Derim at 6°13'S 147°06'E (4 ♀, RMNH), Finschhafen (7 ♀, BISH), 14.4 km W Lae (1 ♀, BISH), Lake Trist (1 ♀, BISH), Mindik (1 ♀, BISH), Mount Missim at 7°15'S 146°48'E (3 ♀, BISH), Simbang (1 ♀, MTM), Umboi Island: 8 km WNW Lab Lab (1 ♀, BISH), Wau (31 ♀, BISH; 1 ♀, RMNH), Wau: Mount Kaindi at 2,100 m (1 ♀, RMNH) and at 2,350 m (3 ♀, BISH). **National Capital District:** Laloki (1 ♀, BISH). **New Britain:** Bainings in Gazelle Peninsula: Saint Paul (5 ♀, BISH), Duke of York Islands: no specific locality (1 ♀, NHMW, lectotype of *Pison collare*),

Illugi on upper Warangoi River in Gazelle Peninsula (1 ♀, BISH), Jacquinot Bay (1 ♂, CAS), Linga Linga plain in Willaumez Peninsula (1 ♀, BISH), upper Warangoi River (1 ♀, BISH), Yalom (2 ♀, ZMUC, CAS, holotype and paratype of *Pison bismarckianum*). **Oro** (= Northern) **Province**: Kokoda, 2000 feet (1 ♀, BMNH), Kokoda-Pitoki (1 ♀, BISH), Mount Suckling, 500 m (3 ♀, BISH), Popondetta (1 ♀, BISH). **Southern Highlands Province**: 8 km W Mendi (1 ♀, BISH), Mount Giluwe at 2,550 m (5 ♀, BISH). **Western Province**: Kiunga (1 ♀, BISH), Oriomo (1 ♀, BISH). **West Sepik Province**: junction of Green and Sepik Rivers (1 ♀, BISH), Torricelli Mountains (1 ♀, SAM).

**SOLOMON ISLANDS**: **Choiseul Island**: Kitipi River (3 ♀, BISH), Kolombangara River (1 ♀, BISH), Malangona (8 ♀, BISH). **Fauro Island**: Toumoa (2 ♀, BISH). **Guadalcanal**: Doma-Ruanu'u (1 ♀, RMNH), Guadalcanal and Florida (now Nggela) Islands (1 ♀, CAS), Honiara (8 ♀, 1 ♂, BISH), 35 km E Honiara (2 ♀, BISH), Lunga River, bridge (1 ♀, BISH), Mount Jonapau in Suta-Gold Ridge (1 ♀, BISH), Paripao (1 ♀, BISH), Tenaru River (1 ♀, BISH; 2 ♀, 1 ♂, CAS), locality illegible (1 ♂, RMNH). **Malaita Island**: Dala (29 ♀, 1 ♂, BISH), Su'u (1 ♀, RMNH). **New Georgia Islands**: Gizo Island (1 ♀, AMS; 4 ♀, BISH), Kolombangara Island: Pepele (8 ♀, BISH), New Georgia Island: Munda (2 ♀, BISH), Ringgi Cove (1 ♀, BISH), and Vella Lavella Island: Dobeli jungle (1 ♂, RMNH), Pisisama (1 ♀, BISH), and Ulo Crater (3 ♀, BISH). **Nggela Islands** (formerly Florida Islands): Gairava (1 ♀, BISH), Haleta (9 ♀, BISH). **Russell Islands**: Pavuvu (2 ♀, BISH; 1 ♀, CAS), Pepesala (5 ♀, BISH). **San Cristobal Island**: Bweinaniawarikiapu (1 ♀, BISH), Kira-Kira (1 ♀, BISH), Wugiroga 1 ♀, BISH). **Santa Ysabel**: Sukapisu (1 ♀, BISH), SE Tatamba (1 ♀, BISH), no specific locality (1 ♀, BISH). **Tulagi Island**: no specific locality (2 ♀, BISH; 7 ♀, 1 ♂, RMNH).

### *Pison pusillum* Pulawski, species nova

Figures 922-928.

**NAME DERIVATION.**—*Pusillum* is a Latin neuter adjective meaning *small, minute*; with reference to the small body size of this species.

**RECOGNITION.**—*Pison pusillum* is one of the smallest species of the genus (length 4.5-5.7 mm in female, 3.8-4.5 mm in male), with a black head (except the mandible), thorax, propodeum, gaster, and femora, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and the setae appressed on tergum I. The female is characterized by the presence of an unsculptured, glabrous area on each side of the oral fossa, bordered by a row of erect setae (psammophore). It differs from similar species by the following combination: ocellular distance less than hindocellar diameter, free margin of clypeal lamella roundly arcuate (width of lamella slightly less than distance that separates it from adjacent orbit), mandible simple apically (not tridentate), scutal setae appressed, mesopleural punctures almost compressed, and tergal setae silvery. *Pison setiferum* is similar, but unlike that species, the dorsal length of flagellomere I is  $1.8 \times$  apical width in *P. pusillum* (rather than 2.0-2.1), the setae of the upper frons are oriented ventrally (rather than dorsally), the mandible of many specimens is yellowish mesally (rather than dark reddish), and the tegula is larger, in many forewing positions fully covering the humeral plate (rather than not covering).

In the male, sternum VIII has the apical margin rounded, the flagellum cylindrical, without tyloids, the dorsal length of flagellomere I  $1.3-1.5 \times$  its apical width, the clypeal lamella acutely angulate (not concave on each side of the midpoint), the mandibular apex simple (not bidentate), the setae of the upper frons oriented ventrally, the propleuron densely punctate, the tegula relatively large, in many specimens completely covering the humeral plate, the sterna have no unusual structures (no transverse swelling or tooth, no glabrous preapical areas, sternum VIII without longitudinal sulcus), tergum VII and sternum VII have no erect setae apicolaterally, sternum II mesally (except near base) and sternum III mesally are aciculate, with punctures more than one diameter apart.





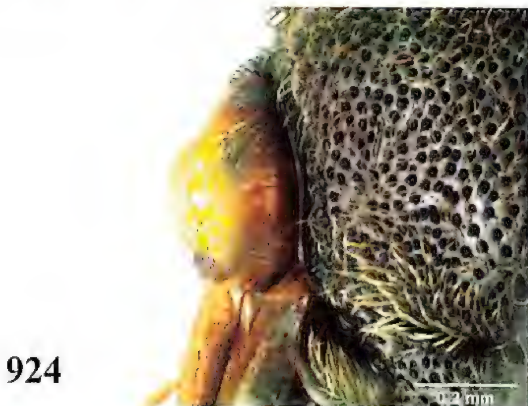
922

0.2 mm

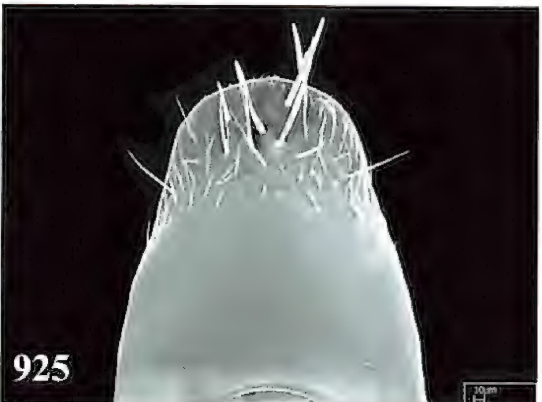


923

0.2 mm

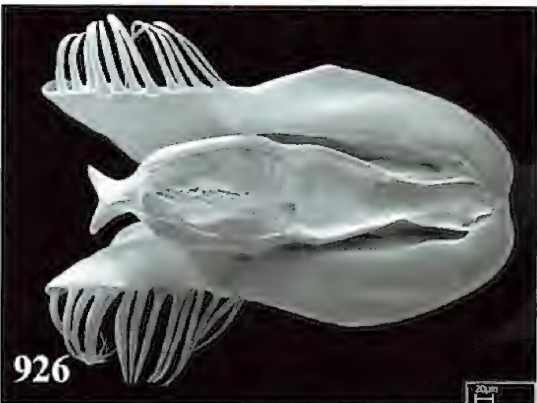


924



925

10 μm



926



927

10 μm

FIGURES 922-927. *Pison pusillum* Pulawski, sp. nov. (922) Female clypeus and mandibles; (923) Male clypeus and mandibles; (924) Female tegula and adjacent scutum; male; (925) Sternum VIII (ventral surface); (926) Genitalia in dorsal view; (927) Genitalia in lateral view.

**DESCRIPTION.**—Frons dull, punctures less than one diameter apart, minute in female, well defined in male. Occipital carina not interrupted medioventrally, narrowly separated from hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum minutely foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined (Fig. 924); many punctures more than one diameter apart in Australian females (only some punctures more than one diameter apart in Australian males), but all punctures less than one diameter apart in Papuan females; interspaces unsculptured. Tegula enlarged, in many forewing positions fully covering humeral plate. Mesopleural punctures almost contiguous, largely concealed by vestiture. Postspiracular carina present, about half as long to as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged basally (ridges becoming evanescent in apical half), punctate between ridges; side and posterior surface ridged, punctate between ridges (ridges on side smaller than those on posterior surface). Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I well defined, averaging about one diameter apart at center of horizontal part (before apical depression). Sternum II mesally (except near base) and sternum III mesally aciculate, with punctures more than one diameter apart (in male punctures varying from minute to conspicuous).

Setae silvery, appressed on frons, scutum, and tergum I, oriented ventrally on upper frons (between upper end of midfrontal carina and midocellus), completely concealing integument on clypeus in both sexes (except lamella); setae of lower gena straight (see below for details). Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, femora, and gaster black; mandible varying from mostly black to black basally, yellowish mesally, ferruginous subapically, dark apically; flagellum varying from all black to yellowish brown. Tibiae and tarsi varying from black to ferruginous; hindtibial spurs whitish.

♀.—Upper interocular distance equal to  $0.68-0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.6-0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2 \times$  hindocellar diameter; eye height equal to  $0.98-1.00 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate, with obtuse lateral corner, distance between corners slightly less than distance between one corner and adjacent orbit (Fig. 922). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere IX  $1.1-1.2 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with relatively short psammophores (longest setae of genal, mandibular, and forefemoral psammophores all about  $0.5 \times$  of greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophores. Mandible: trimmal carina with small incision at about midlength. Length 4.5-5.3 mm, head width 1.5-1.8 mm in Australian specimens, 5.3-5.7 mm and 1.6-1.8 mm, respectively, in specimens from Papua New Guinea.

♂.—Upper interocular distance equal to  $0.76-0.82 \times$  lower interocular distance; ocellocular distance equal to  $0.7-0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.2 \times$  hindocellar diameter; eye height equal to  $0.96-0.98 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 923). Dorsal length of flagellomere I  $1.3-1.5 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Setae of lower gena varying from straight to sinuous, from nearly appressed to nearly erect, and from as long as to slightly longer than midocellar diameter. Sternum VIII punctate apically, its apical margin arcuate (Fig. 925). Genitalia: Figs. 926, 927. Length 3.8-6.0 mm; head width 1.2-1.8 mm.



**GEOGRAPHIC DISTRIBUTION** (Fig. 928).—

Northern Territory, Queensland, Western Australia, and southeastern Papua New Guinea.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **Northern Territory:** Keep River National Park at 15°47'49"S 129°06'31"E, 3-6 June 2001, C. Lambkin, M.E. Irwin, and F.D. Parker (ANIC).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Caranbirini Waterhole 33 km SW Borroloola at 16°16'S 136°05'E, 22 Apr 1976, D.H. Colless (2 ♂, ANIC); Gregory National Park at 15°36'43"S 130°24'08"E, 6-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (4 ♀, 5 ♂, CAS), at 15°58.3'S 130°29.3'E, T. Weir, K. Pullen, and P. Bouchard (1 ♂, ANIC; 1 ♀, CAS), at 15°58'17"S 130°29'17"E, 24 May – 4 June 2001, T. Weir, K. Pullen, and P. Bouchard (2 ♂, ANIC; 1 ♀, CAS), at 16°00'31"S 130°38'49"E, 16-18 June 2001, M. E. Irwin and F.D. Parker (1 ♀, CAS), at 16°02.4'S 130°27.3'E, 6-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), at 16°03'44"S 130°27'04"E, 24 May – 4 June 2001, T. Weir, K. Pullen, and P. Bouchard (2 ♀, ANIC; 1 ♂, CAS), at 16°03.7'S 130°27.1'E, 6-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (2 ♀, ANIC; 1 ♂, CAS), at 16°06'42"S 130°25'23"E, 24 May – 5 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, ANIC), at 16°06.6'S 130°25.7'E, 4-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (3 ♀, 3 ♂, ANIC; 9 ♀, 1 ♂, CAS), at 16°06.8'S 130°25.4'E, 19-24 May 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♂, CAS), at 16°07'55"S 130°26'11"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 12-15 June 2001 (2 ♂, ANIC), 13-15 June 2001 (1 ♀, CAS) and 16-18 June 2001 (1 ♂, CAS), at 16°10'49"S 130°25'51"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 12 June 2001 (2 ♂, ANIC) and 16-28 June 2001 (1 ♂, ANIC; 2 ♀, CAS), at 16°12'47"S 130°25'11"E, 5-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC; 2 ♂, CAS); 65 km S Kalkarindji at 17°55.9'S 130°49.7'E, 11-17 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, 1 ♂, CAS); Keep River National Park: same data as holotype (4 ♀, ANIC; 1 ♂, CAS), at 15°47'49"S 129°06'31"E, 8-10 June 2001, C. Lambkin, F.D. Parker, and M.E. Irwin (2 ♂, CAS), at 15°54'55"S 129°04'11"E, 31 May – 3 June 2001, T. Weir, K. Pullen, and P. Bouchard (2 ♀, 2 ♂, CAS), and M.E. Irwin, F.D. Parker, and C. Lambkin, 1-3 June 2001 (1 ♂, CAS) and 6-9 June 2001 (1 ♀, 1 ♂, CAS), at 15°57'06"S 129°01'50"E, 6-8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), at 15°57'33"S 129°01'44"E, 3-8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, ANIC; 1 ♂, CAS), at 15°57'55"S 129°01'52"E, 3-8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), and at 16°03'01"S 130°24'07"E, 5-13 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS); 27 km S Mount Breadren at 24°53'S 133°12'E, 22 Sept 1978, J.C. Cardale (1 ♀, ANIC); Victoria Highway 38.5 km SW Timber Creek at 15°42'40"S 130°07'48"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 6-13 June 2001 (2 ♂, ANIC; 2 ♀, CAS), 13-19 June 2001 (1 ♀, CAS), and 15-19 June 2001 (2 ♀, ANIC); Victoria Highway 109 km WSW Timber Creek at 15°56'11"S 129°35'22"E, 6-13 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (3 ♀, 2 ♂, CAS); same locality, M.E. Irwin and F.D. Parker, 13-16 June 2001 (1 ♂, CAS) and 15-19 June 2001 (2 ♂, CAS). **Queensland:** Batavia Downs at 12°40'S 142°39'E, 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (1 ♂, ANIC); 4 km NE Batavia Downs at 12°39'S 142°42'E, 22 Aug – 16 Sept 1992, P. Zborowski and L. Miller (3 ♀, ANIC), 24 Oct – 23 Nov 1992, P. Zborowski and A. Calder (2 ♀, ANIC), and 11 Dec 1992 – 17 Jan 1993, P. Zborowski (1 ♀, ANIC); 5 km S Batavia Downs at 12°41'S 142°41'E, 23 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC) and 16 Sept – 24 Oct 1992, P. Zborowski and T. Weir (2 ♀, ANIC); 7 km S Batavia Downs at 12°42'S 142°42'E, 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (2 ♀, ANIC); 3 km W Batavia Downs at 12°40'S 142°39'E, 18 June – 22 July 1992, P. Zborowski and E.S. Nielsen (2 ♂, ANIC); Holts Creek 8 km N Musselbrook Camp at 18°33'S 138°11'E, 10-20 May 1995, I.D. Naumann (1 ♀, ANIC); Lawn Hill (now Boodjamulla) National Park 10 km ESE Musselbrook at 18°38'13"S 138°12'29"E, 13 May 1995, G. Daniels and M.A. Schneider (1 ♀, ANIC); Lawn Hill (now Bood-



FIGURE 928. Collecting localities of *Pison pusillum* Pulawski, sp. nov.

jamulla) National Park 24 km ESE Musselbrook at 18°40'15"S 138°22'15"E, 12 May 1995, G. Daniels and M.A. Schneider (1 ♀, ANIC); Musselbrook Camp at 18°36'S 138°08'E, 8-21 May 1995, I.D. Naumann (1 ♂, ANIC). **Western Australia:** Carson escarpment at 14°49'S 126°49'E (1 ♂, ANIC); 10 km NW Kununurra at 15°46'S 128°38'E, 8 May 1983, I.D. Naumann and J.C. Cardale (1 ♀, ANIC); Lennard River crossing at 17°23'S 24°44'E, 14-28 July 1988, T.F. Houston (2 ♂, WAM); Nanutarra – Wittenoom road at 22°26'36"S 117°48'23"E, 22-27 Sept 2005, CVA [= Conservation Volunteers Australia] (2 ♂, AMS).

**PAPUA NEW GUINEA: Central Province:** Lake Iaraguma 20 km NW Port Moresby, 21 June 1988, W.J. Pulawski (2 ♀, CAS).

*Pison quinquecarinatum* Pulawski, species nova

Figures 929-935.

**NAME DERIVATION.**— *Quinquecarinatum* is derived from the Latin numeral *quinque*, meaning five, and the neuter adjective *carinatum*, derived from *carina*, and meaning with *carina* or *carinae*; with reference to the presence of five longitudinal carinae on the propodeum.

**RECOGNITION.**— *Pison quinquecarinatum* is unique in having two pairs of carinae on the propodeum in addition to the median carina: the outer pair consist of the usual carinae that extend between the gastropodeal articulation and the spiracle, and the inner pair delimit the enclosure (Fig. 931). The presence of only two submarginal cells is a subsidiary recognition feature.

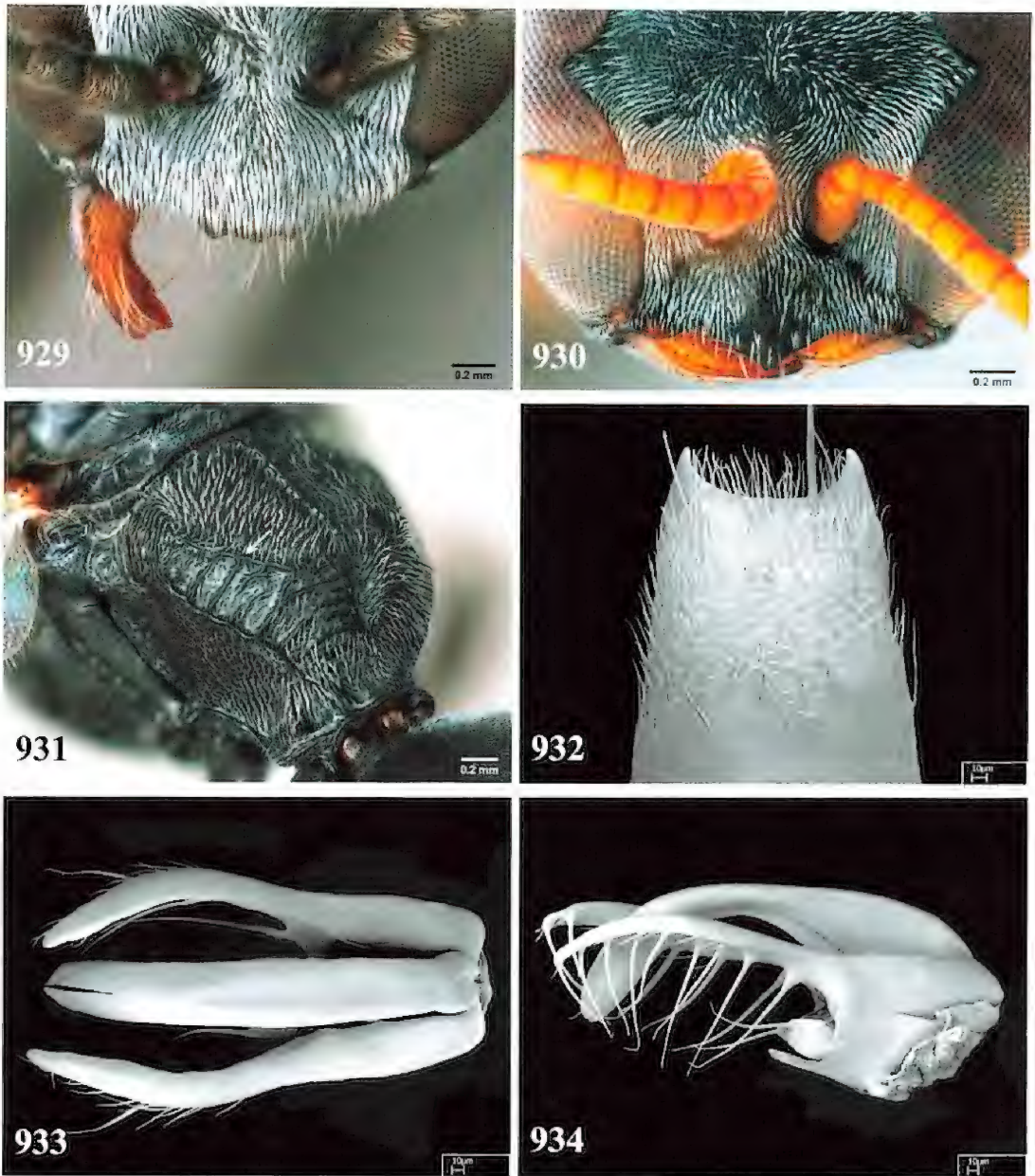
**DESCRIPTION.**— Frons dull, minutely punctate, punctures less than one diameter apart, middle supraantennal carina absent. Hypostomal carina somewhat expanded ventrally. Gena narrow in dorsal view. Labrum emarginate. Anteromedian pronotal pit either absent or transversely elongate, slightly longer than midocellar diameter. Scutum foveate along flange, with well-defined longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart in most specimens, but about one diameter apart near center in one male; interspaces dull in female, shiny in male. Scutellum with foveate sulcus along anterior margin. Tegula enlarged, posterolaterally either impunctate or microscopically punctate, fully concealing humeral plate. Mesopleural punctures less than one diameter apart in female, in male varying from about one to about two diameters apart. Postspiracular carina absent in female, present in male (about 1.5 × as long as midocellar diameter); integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus impressed along entire length. Propodeum with irregular longitudinal carina extending from gastral socket area toward spiracle; dorsum with a pair of carinae delimiting enclosure, obliquely ridged (Fig. 931), punctate between ridges (ridges inconspicuous in female, conspicuous in male); side punctate mesally, ridged along margins; posterior surface conspicuously, transversely ridged. Forewing with two submarginal cells, length of posterior margin of second cell 1.0-1.2 × its height. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I about one diameter apart in female, up to about two diameters in male. Sterna finely punctate throughout.

Setae silvery, appressed on frons, gena (erect, shorter than midocellar diameter on lower gena next to occipital carina), thorax, and tergum I; nearly completely concealing integument on clypeus in female, not concealing in male). Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, antenna black in female, ferruginous in male, mandible ferruginous, dark apically. Legs black in female, in male femora black, tibiae, and tarsi yellowish brown (tibiae black dorsally in most specimens). Mid- and hindtibial spurs whitish.

♀.— Upper interocular distance equal to 0.78 × lower interocular distance; ocellocular distance equal to 1.0 × hindocellar diameter, distance between hindocelli equal to 1.4 × hindocellar diameter; eye height equal to 0.90 × distance between eye notches. Free margin of clypeal lamella obtusely tridentate (Fig. 929). Dorsal length of flagellomere I 1.4 × apical width, of flagellomere IX 0.9





FIGURES 929-934. *Pison quinquecarinatum* Pulawski, sp. nov. (929) Female clypeus and mandible; (930) Male clypeus; (931) Male propodeum in lateral oblique view (arrow shows additional carina delimiting propodeal enclosure); male; (932) Sternum VIII (ventral view); (933) Genitalia in dorsal view; (934) Genitalia in lateral view.

$\times$  apical width. Mandible: trimmal carina with minute incision shortly beyond midlength. Length 6.2 mm; head width 1.5 mm.

♂.— Upper interocular distance equal to  $0.98\text{--}1.00 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $1.02\text{--}1.04 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 930). Dorsal length of flagellomere I  $1.6\text{--}1.7 \times$  apical width, of flagellomere X  $0.9 \times$  apical width. Apical margin of sternum VIII broadly, shallowly emarginate (Fig. 932). Genitalia: Figs. 933, 934. Length 4.1–4.5 mm; head width 1.2–1.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 935).— Northern parts of Northern Territory, of Queensland, and of Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA:** **Queensland:** 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$ , 24 Oct – 23 Nov 1992, P. Zborowski and A. Calder (ANIC).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Gregory National Park at  $16^{\circ}06.6'S$   $130^{\circ}25.7'E$ , 12–16 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, ANIC); Kakadu National Park: Deaf Adder Valley: Leichardt Gallery, 27 Mar 1980, I.D. Naumann (1 ♀, ANIC). **Queensland:** same data as holotype (1 ♂, CAS); 7 km S Batavia Downs at  $12^{\circ}43'S$   $142^{\circ}42'E$ , 24 Oct – 23 Nov 1992, P. Zborowski and A. Calder (1 ♂, CAS) and 23 Nov – 11 Dec 1992, P. Zborowski and E. Dressler (1 ♂, ANIC). **Western Australia:** Lone Dingo on Mitchell Plateau at  $14^{\circ}35'S$   $125^{\circ}45'E$ , 9–19 May 1983, I.D. Naumann and J.C. Cardale (1 ♀, ANIC).



FIGURE 935. Collecting localities of *Pison quinquecarinatum* Pulawski, sp. nov.

### *Pison radians* Pulawski, species nova

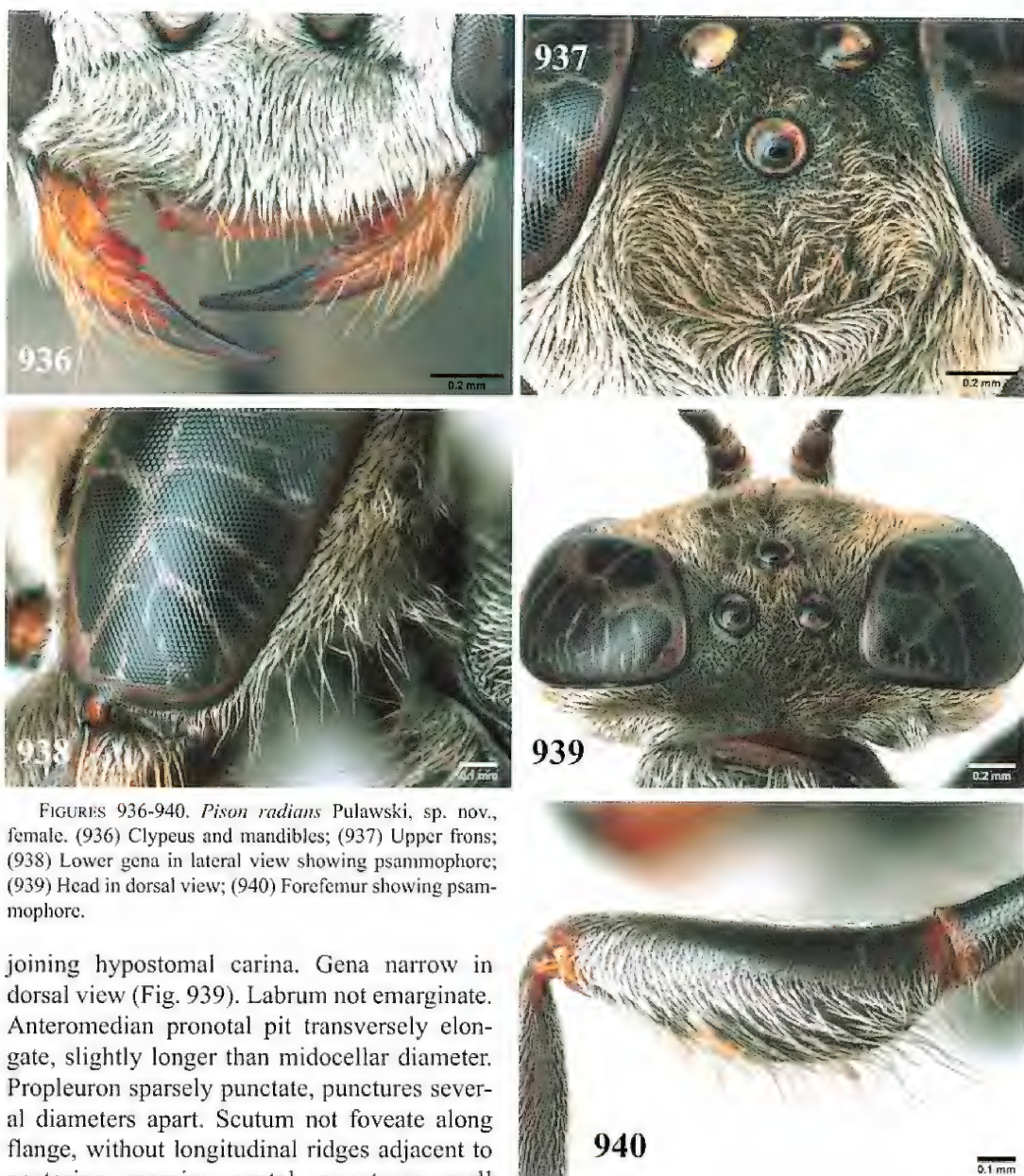
Figures 936–941.

**NAME DERIVATION.**— *Radians*, present active participle of the Latin verb *radiare*, to radiate; with reference to the orientation of setae of the upper frons.

**RECOGNITION.**— The female of *Pison radians* (the male is unknown) is characterized by the presence of a psammophore on the mandible, lower gena (Fig. 938), and forefemoral venter, and the lower gena unsculptured, shiny, and asetose between the hypostomal carina and the psammophore. It can be differentiated from the other species with these characters in having the setae characteristically radiating from the midpoint of the upper frons (Fig. 937). The following combination is also diagnostic: gaster, femora and tibiae black; clypeal lamella nearly straight, with obtusely angular corner, minimally wider than distance that separates it from eye margin (Fig. 936); mandible simple apically; ocellocular distance equal to  $0.5\text{--}0.6 \times$  hindocellar diameter, smaller than interocellar distance; scutal punctures nearly all less than one diameter apart, but not contiguous; most punctures of propleuron several diameters apart; propodeum with well-defined longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; sterna punctate throughout; setae of frons, thorax, propodeal dorsum, and femora silvery, not completely concealing integument on mesopleuron and propodeal dorsum, but completely concealing on clypeus (except lamella); wings nearly hyaline; gastral terga with setal fasciae on apical depressions.

**DESCRIPTION.**— Frons dull, minutely punctate, punctures nearly contiguous. Occipital carina





FIGURES 936-940. *Pison radians* Pulawski, sp. nov., female. (936) Clypeus and mandibles; (937) Upper frons; (938) Lower gena in lateral view showing psammophore; (939) Head in dorsal view; (940) Forefemur showing psammophore.

joining hypostomal carina. Gena narrow in dorsal view (Fig. 939). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Propleuron sparsely punctate, punctures several diameters apart. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, nearly all less than one diameter apart; interspaces unsculptured. Tegula enlarged. Mesopleural punctures well defined, nearly contiguous, about one diameter apart posteroventrally. Postspiracular carina present, varying from shorter to longer than midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, minutely punctate between ridges; side ridged (conspicuously so dorsally), punctate between ridges; posterior surface transversely ridged. Posteroventral forefemoral surface finely, closely punctate. Hindcoxal dorsum with outer margin sharply carinate. Punctures of tergum I less than one diameter apart. Sterna punctate throughout.

joining hypostomal carina. Gena narrow in dorsal view (Fig. 939). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Propleuron sparsely punctate, punctures several diameters apart. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, nearly all less than one diameter apart; interspaces unsculptured. Tegula enlarged. Mesopleural punctures well defined, nearly contiguous, about one diameter apart posteroventrally. Postspiracular carina present, varying from shorter to longer than midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, minutely punctate between ridges; side ridged (conspicuously so dorsally), punctate between ridges; posterior surface transversely ridged. Posteroventral forefemoral surface finely, closely punctate. Hindcoxal dorsum with outer margin sharply carinate. Punctures of tergum I less than one diameter apart. Sterna punctate throughout.

Setae silvery, subappressed on upper frons, appressed on scutum, propodeal dorsum, and tergum I; radiating from midpoint on upper frons (Fig. 937); completely concealing integument on clypeus; setal gena: see below. Apical depressions of terga with setal fasciae, fasciae silvery or with golden tinge.

Body black, mandible yellowish brown in basal half, apical depressions of terga brown, tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.68\text{--}0.70 \times$  lower interocular distance; ocellular distance equal to  $0.5\text{--}0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}1.2 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}0.98 \times$  distance between eye notches. Free margin of clypeal lamella nearly truncate, with well-defined lateral corner (Fig. 936); distance between corners  $1.1\text{--}1.2 \times$  distance between corner and adjacent orbit. Dorsal length of flagellomere I  $1.5\text{--}1.7 \times$  apical width, of flagellomere IX  $0.9\text{--}1.0 \times$  apical width. Lower gena (Fig. 938), mandibular posterior margin, propleural outer margin, and forefemoral venter (Fig. 940) with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.7 \times$ ,  $0.7\text{--}1.0 \times$ , and  $0.8 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and aetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision at about midlength. Length  $5.6\text{--}7.7$  mm; head width  $1.8\text{--}2.2$  mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 941).—Northern part of Northern Territory.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Northern Territory: Keep River National Park at  $15^{\circ}57'55''\text{S}$   $129^{\circ}01'52''\text{E}$ , 13–20 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

PARATYPES: AUSTRALIA: Northern Territory: Keep River National Park at  $15^{\circ}57'33''\text{S}$   $129^{\circ}01'44''\text{E}$ , 1 May – 3 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS); Victoria Highway 38.5 km SW Timber Creek at  $15^{\circ}42'40''\text{S}$   $130^{\circ}07'48''\text{E}$ , M.E. Irwin, F.D. Parker, and C. Lambkin, 6–13 June 2001 (1 ♀, CAS), 13–19 June 2001 (2 ♀, CAS), 15–19 June 2001 (1 ♀, ANIC; 1 ♀, CAS).



FIGURE 941. Collecting localities of *Pison radians* Pulawski, sp. nov.

### *Pison rarum* Pulawski, species nova

Figures 942–945.

**NAME DERIVATION.**—*Rarum* is a Latin neuter adjective, meaning *rare*; with reference to the fact that only six specimens were available for this study.

**RECOGNITION.**—*Pison rarum*, known from the female sex only, is an all black species, with the setae silvery on the scutum and erect on tergum I, and with sterna III and IV with a few, sparse punctures on each side of midline. It is further characterized by the following character combination: mesopleural punctures less than one diameter apart; punctures of upper frons fine, about  $0.1 \times$  midocellar diameter; posterior mandibular margin gradually curving toward apex (not step-like); inner mandibular margin simple (not tridentate apically); gena punctate and setose adjacent to oral fossa; tergal setae silvery; and dorsal length of flagellomere I  $2.3\text{--}2.4 \times$  apical width. Subsidiary recognition features are: the punctures in the anterior half of the scutum are no more than one diameter apart, and the punctures of the scutellum are sparser than most punctures on the scutum.





FIGURES 942-944. *Pison rarum* Pulawski, sp. nov., female. (942). Clypeus and mandibles; (943) Head in dorsal view; (944). Propodeal dorsum.



**DESCRIPTION.**—Frons dull, punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 943). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about half as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, less than one diameter apart except in specimens from Queensland with several punctures behind center more than one diameter apart. Tegula slightly enlarged. Mesopleural punctures well defined, less than one diameter apart; interspaces unsculptured, shiny, posteriorly merging into minute ridges. Postspiracular carina absent. Metapleural sulcus finely costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, punctures small and compressed against each other laterally, markedly larger and up to one diameter apart toward midline (Fig. 944), interspaces merging into irregular, oblique ridges; side punctate (punctures less than one diameter apart), interspaces merging into longitudinal ridges; posterior surface punctate and finely, transversely ridged. Most punctures of posteroventral forefemoral surface more than one diameter apart. Hindcoxal dorsum with outer margin sharply carinate. Punctures of tergum I about one diameter apart on horizontal portion, but significantly smaller and compressed against each other on apical depression. Sternum II apicomesally and sterna III and IV with punctures many diameters apart along midline.

Setae silvery, erect on upper frons, gena, scutum, thorax, forecoxal venter, femoral venters, and tergum I; setae of lower gena practically straight, up to  $2.5 \times$  as long as midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.80-0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.3-1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.1 \times$  hindocellar diameter; eye height equal to  $0.86 \times$  distance between eye notches. Free margin of clypeal lamella markedly arcuate (Fig. 942). Dorsal length of flagellomere I  $2.3-2.4 \times$  apical width,

of flagellomere IX  $1.1\text{--}1.3 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length  $9.0\text{--}10.5$  mm; head width  $2.9\text{--}3.1$  mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 945).—Northern part of Northern Territory and eastern Queensland.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **Queensland:** Haliday Bay 50 km NE Mackay, 19 Sept 1983, N.W. Rodd (AMS).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Melville Island: Kilu-impini Creek 9 km E Pirlangimpi at  $11^{\circ}25'S$   $130^{\circ}31'E$ , 15 Oct 1996, G.R. Brown and G. Dally (1 ♀, NTM). **Queensland:** Bundaberg, 18 Apr 1972, H. Frauca (1 ♀, ANIC); Paluma Range National Park at  $18^{\circ}51.6'S$   $146^{\circ}07.6'E$ , alt. ca 50 m, 24 Nov 2006, W.J. Pulawski (2 ♀, CAS); 11 km S Townsville at  $19^{\circ}21.8'S$   $146^{\circ}53.2'E$ , 15 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS).



FIGURE 945. Collecting localities of *Pison varum* Pulawski, sp. nov.

***Pison rotundum* Pulawski, species nova**

Figures 946–947.

**NAME DERIVATION.**—*Rotundum*, a Latin neuter adjective meaning *rounded*; with reference to the rounded free clypeal margin of the female.

**RECOGNITION.**—The female of *P. rotundum* (the male is unknown) has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It shares with *P. longulum* the regularly rounded clypeal free margin, forming a single arch from one orbit to the other (Fig. 946). It differs from *P. longulum* in having a shorter propodeal dorsum (about  $1.5 \times$  as long mesally as the scutellum, rather than twice as long), a shorter flagellomere I (dorsal length  $2.1 \times$  apical width, rather than  $2.5\text{--}2.6 \times$ ), covered with minute, inconspicuous punctures (rather than conspicuous punctures), and in having the scutellum slightly more convex. Also similar are *P. laterirugosum* and *P. sinuosum* (only the females are known), in which, however, the clypeal free margin is minimally concave on each side, the dorsal length of flagellomere I is  $2.7\text{--}3.2 \times$  apical width ( $2.1 \times$  apical width in *P. rotundum*), and in *P. laterirugosum*, the side of the propodeal dorsum is conspicuously ridged (inconspicuously so in *P. rotundum*).



FIGURE 946. *Pison rotundum* Pulawski, sp. nov., female. Clypeus and mandibles.

**DESCRIPTION.**—Frons dull, finely punctate, punctures shallow, ill defined, no more than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate except nearly impunctate anteriorly. Scutum not foveate along



flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, shallow, averaging about one diameter apart. Tegula not enlarged. Mesopleural punctures compressed against each other. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits; ventral half of metapleuron with microscopic punctures. Propodeum with inconspicuous longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges becoming evanescent toward lateral margin); side irregularly ridged, punctate between ridges; posterior surface conspicuously transversely ridged. Posteroventral forefemoral surface finely punctate, punctures about 1-2 diameters apart. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I about one diameter apart on horizontal part, less than that on apical depression. Sternum II punctate throughout, punctures conspicuous mesally and averaging about 1-2 diameters apart.

Setae silvery, suberect (partly erect) on frons, about as long as half midocellar diameter, diverging toward dorsum from midline between dorsal end of midscutal carina and midocellus, appressed on scutum and tergum I; on lower gena straight, slightly shorter than one midocellar diameter; not concealing integument on clypeus (sculpture easily visible). Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible ferruginous mesally.

♀.—Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella forming single regular arch from orbit to orbit, not concave laterally (Fig. 946). Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 5.5 mm; head width 1.8 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 947).—Known from two localities in eastern Queensland.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA: Queensland:** Eungella National Park, 16-19 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (QMB, registration number T228760).

**PARATYPE:** **AUSTRALIA: Queensland:** same data as holotype (2 ♀, QMB); Lake Monduran at  $24^{\circ}52.1'S$   $151^{\circ}51.0'E$ , 26 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS).



FIGURE 947. Collecting localities of *Pison rotundum* Pulawski, sp. nov.

### *Pison rufigaster* Pulawski, species nova

Figures 948-959.

**NAME DERIVATION.**—*Rufigaster* is derived from two Latin words: *rufus*, red, and *gaster* (also Greek γαστήρ), belly, venter; with reference to the gaster color of this species; a noun in apposition to the generic name.

**RECOGNITION.**—*Pison rufigaster* has the second recurrent vein received near the middle of the second submarginal cell, black thorax and propodeum, all or largely ferruginous gaster, and ferruginous tibiae. It is most similar to *P. peletieri*, from which it differs in having small but not microscopic scutal punctures (punctures microscopically small in *P. peletieri*), the clypeal lobe of

the female prominent, with the free margin of the lamella obtusely arcuate (in the female of *P. peletieri*, the clypeal lobe is nonprominent, and the free margin of the lamella is truncate or nearly so), and in the male the free margin of the clypeal lamella roundly arcuate (rather than with a median point or acutely to obtusely angulate). Also similar is *P. deperditum*, in which the episcrobal area is ridged or rugose (punctate in *P. rufigaster*) and the longitudinal ridges adjacent to the scutal posterior margin are twice as long as the ridges near the anterior margin of the scutellum (rather than about equal), and the female of *P. frontale* (male unknown), in which the clypeal lobe is not differentiated and the frons is conspicuously swollen above the antennal socket (in *P. rufigaster*, the clypeal lobe is well defined and the frons is not swollen).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Distance between antennal socket and orbit slightly less than socket width in female, about equal in male. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit round, about equal to midocellar diameter. Scutum foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, less than one diameter apart (Fig. 950); interspaces microsculptured, dull. Tegula slightly enlarged. Mesopleural punctures slightly larger than those on scutum, nearly compressed against each other; many interspaces merging into fine ridges. Postspiracular carina present, 1.0-1.5  $\times$  as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with conspicuous oblique ridges, in most specimens with middle carina in shallow sulcus; side ridged, punctate between ridges; posterior surface rugose dorsally, transversely ridged ventrally, with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Forewing with three submarginal cells; second recurrent vein joining submarginal cell II at its midlength. Outer surface of hindtibia with evanescent spines. Punctures of tergum I about one diameter apart anterior to apical depression. Sternum II punctate throughout, punctures more than one diameter apart mesally (Fig. 951).

Setae silvery, appressed on frons, thorax, and tergum I; on frons oriented ventrally on ventral half, oriented dorsally in dorsal half, radiating next to midocellus and, in addition, sparse, erect setae present on dorsal half (setae shorter than half midocellar diameter); on lower gena straight, erect, about as long as half midocellar diameter. Apical depressions of terga with ill-defined setal fasciae, fasciae silvery or golden.

Head, thorax, and propodeum black, female clypeus ferruginous next to lamella; mandible yellowish brown except narrowly black basally and dark apically; antenna ferruginous, apical flagellomeres dark in some specimens. Femora, tibiae, and tarsi ferruginous or femora partly black. Gaster ferruginous, but tergum I black (except apically in female from Warrumbungle National Park) and terga II-V with small, irregular black spots in some females from Almaden.

♀.—Upper interocular distance equal to 0.86-0.92  $\times$  lower interocular distance; ocellocular distance equal to 0.5-1.1  $\times$  hindocellar diameter, distance between hindocelli equal to 0.6-1.1  $\times$  hindocellar diameter; eye height equal to 0.98-1.00  $\times$  distance between eye notches. Clypeal lobe prominent, free margin of lamella obtusely arcuate (Fig. 948). Dorsal length of flagellomere I 2.8-3.2  $\times$  apical width, of flagellomere IX 1.0-1.1  $\times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 6.0-6.8 mm; head width 2.0-2.2 mm.

♂.—Upper interocular distance equal to 0.98-1.0  $\times$  lower interocular distance; ocellocular distance equal to 0.8-0.9  $\times$  hindocellar diameter, distance between hindocelli equal to 0.7-1.0  $\times$  hindocellar diameter; eye height equal to 1.02  $\times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 949). Flagellomeres IV and V slightly to markedly convex





FIGURES 948-952. *Pison rufigaster* Pulawski, sp. nov. (948) Clypeus and mandibles of holotype female; (949) Male clypeus and mandibles; (950) Female tegula and adjacent scutum; (951) Female sternum II; (952) Basal flagellomeres of male.

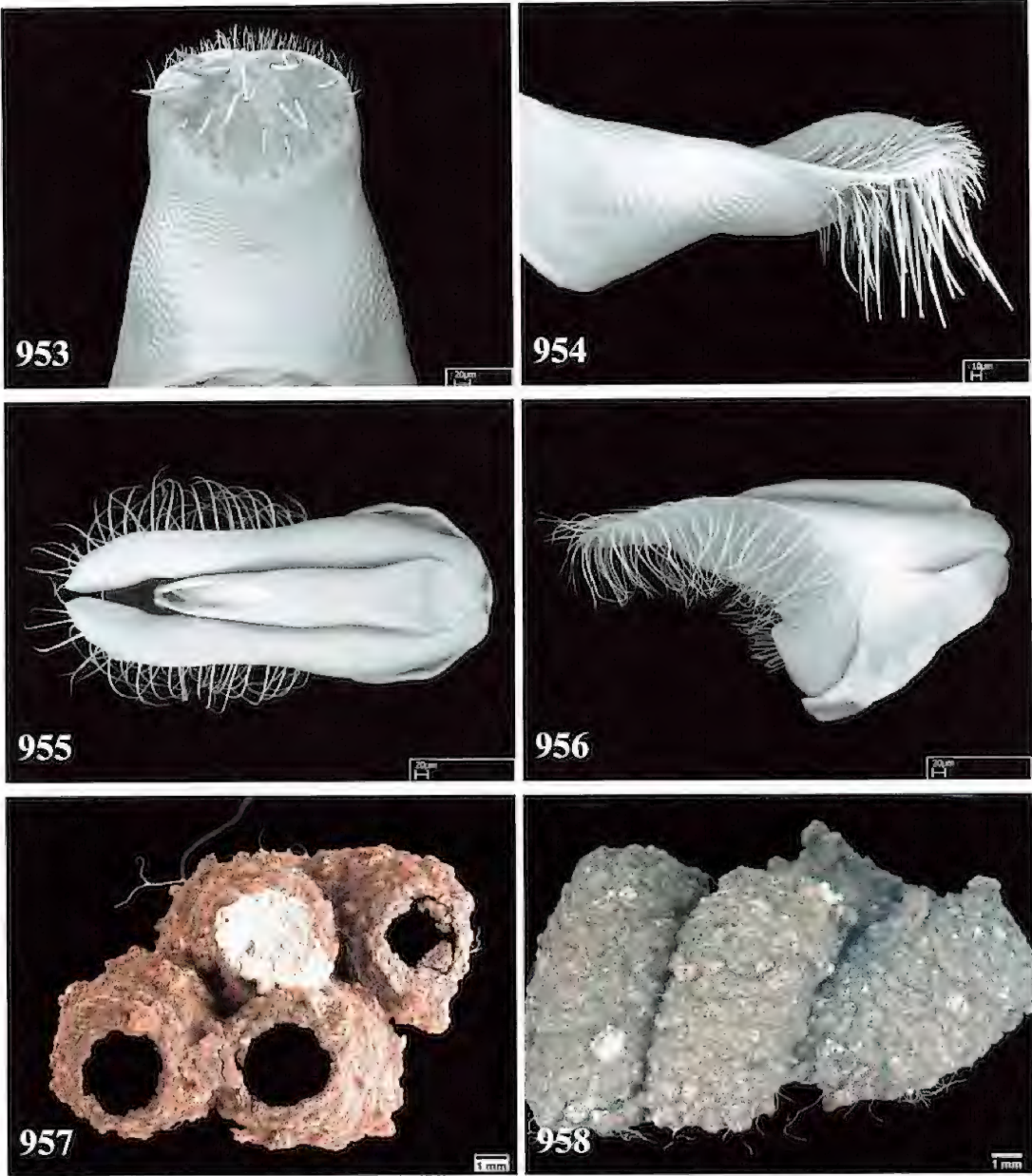
apicoventrally (Fig. 952). Dorsal length of flagellomere I  $2.7-2.8 \times$  apical width, of flagellomere X  $1.0-1.2 \times$  apical width. Apical margin of sternum VIII minimally emarginate, almost truncate (Fig. 953); lateral view: Fig. 954. Genitalia: Figs. 955, 956. Length 4.7-6.2 mm; head width 1.7-1.9 mm.

**NEST STRUCTURE.**— A nest of this species, collected at Almaden, Queensland, is kept in the Australian Museum Sydney, together with two females that emerged from it. It consists of four cells, closely attached to one another by their longitudinal axes, with three cells open at the top and one still closed by an operculum (Fig. 957, 958). Each cell consists of hundreds of small clay lumps, and is rough on the outer side, but smooth on the inside.

**GEOGRAPHIC DISTRIBUTION** (Fig. 959).— Australian Capital Territory, New South Wales, Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Australian Capital Territory: Canberra, 31 Mar 1981, J.R.T. Short (BMNH).





FIGURES 953-956. *Pison rufigaster* Pulawski, sp. nov., male. (953) Sternum VIII (ventral view); (954) Sternum VIII in lateral view; (955) Genitalia in dorsal view; (956) Genitalia in lateral view.

FIGURES 957-958. Nest of *Pison rufigaster* Pulawski, sp. nov. (957) Top view; (958) Side view.



**PARATYPES: AUSTRALIA: Australian Capital Territory:** Black Mountain, Dec 1982, I.D. Naumann and J.C. Cardale (1 ♀, ANIC), 8 Jan 1988, M.E. Irwin (1 ♂, UCD). **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at 31°58.5'S 148°40.5'E, 27 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); 1 km W Eumungerie at 31°56.7'S 148°36.9'E, 24 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Warrensburg National Park, 20 Dec 1987, M.E. Irwin (2 ♀, UCD); Warrumbungle National Park at 31°16.9'S 148°59.1'E, V. Ahrens and W.J. Pulawski, 16 Dec 2009 (1 ♂, CAS) and 17 Dec 2009 (1 ♀, CAS); Warrumbungle National Park at 31°16'S 148°57'E, 17 Dec 1995, M.E. Irwin (1 ♀, MNKB). **Northern Territory:** Alawa, a northwestern suburb of Darwin, Sept 1997, G.R. Brown (1 ♂, NTM); 33 km SSE Alice Springs at 24°01'S 134°01'E, 7 Nov 1979, I.D. Naumann (1 ♂, ANIC); Nangaloar: Nourlangie Rock in Kakadu National Park, 19 Nov 1979, I.D. Naumann (1 ♀, ANIC). **Queensland:** Almaden, W.D. Campbell, Aug-Sept 1927 (1 ♀, AMS), 10 Oct 1927 (2 ♀ reared from nests, AMS), and Oct-Nov 1927 (10 ♀, AMS); 4 km NE Batavia Downs at 12°39'S 142°42'E, 22 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♂, ANIC); 3 km W Batavia Downs at 12°40'S 142°39'E, 18 June – 22 July 1992, P. Zborowski and S.E. Nielsen (1 ♂, ANIC), 23 Aug – 16 Sept 1992, P. Zborowski and L. Miller (2 ♀, ANIC), 16 Sept – 24 Oct 1992, P. Zborowski and T. Weir (1 ♂, ANIC); Bluff Range near Biggenden, 7-19 Aug 1971, H. Frauca (1 ♀, ANIC); Brisbane-Indooroopilly, Dec 1976, Z. Bouček (1 ♀, BMNH); Cedar Park at 16°49'03"S 145°38'05"E, 21 Jan 2002, J. Carpenter and A. Davidson (1 ♂, AMNH); Coen at 13°57'S 143°12'E, 20 Oct – 16 Nov 1993, P. Zborowski and M. Horak (2 ♀, 1 ♂, ANIC), 16 Nov – 17 Dec 1993, P. Zborowski (5 ♀, ANIC), 17 Dec 1993 – 13 Jan 1994, P. Zborowski and E.D. Edwards (1 ♀, ANIC); 39 km NE Dalby at 26°59.6'S 151°33.4'E, 3 Dec 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); 9 km S Dingo Beach at 20°05.5'S 148°30.2'E, 12 Nov 2012, V. Ahrens and W.J. Pulawski (3 ♀, CAS); Edungalba, 1 Jan 1987, H. and A. Howden (1 ♂, ANIC); Fletcher Creek 43 km NW Charters Towers at 19°48.9'S 146°03.3'E, 20 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Hann River at 15°11'S 143°52'E, 17 Aug – 15 Sept 1993, P. Zborowski and S. Shattuck (2 ♀, 1 ♂, ANIC), 20 Oct – 17 Nov 1993, P. Zborowski and M. Horak (1 ♀, ANIC); Maryborough at 25°32'S 152°44'E, 19 Oct 1998, R.W. Matthews (1 ♂, ANIC); 41 km E Moonie, 20 Dec 1976, E.M. Exley and T. Low (1 ♂, QMB); Pendland at 20°31.0'S 145°24.2'E, 18 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 2 km N Rokeby at 13°39'S 142°40'E, 13 Sept – 26 Oct 1993, P. Zborowski and D. Rentz (2 ♂, ANIC), 26 Oct – 16 Nov 1993, P. Zborowski and M. Horak (2 ♀, 1 ♂, ANIC), 16 Nov – 17 Dec 1993, P. Zborowski (8 ♀, ANIC); Split Rock 14 km SE Laura at 15°39'S 144°31'E, 24 June – 29 July 1992, P. Zborowski and E.S. Nielsen (13 ♀, 2 ♂, ANIC), 24 Aug – 21 Sept 1992, P. Zborowski and L. Miller (11 ♀, 10 ♂, ANIC), 30 Oct – 24 Nov 1992, P. Zborowski and A. Calder (6 ♀, ANIC; 5 ♂, CAS), 27 Apr – 28 May 1993, P. Zborowski and A. Roach (2 ♀, 1 ♂, ANIC), 28 May – 26 June 1993, P. Zborowski and I.D. Naumann (2 ♀, 3 ♂, ANIC), 26 June – 16 July 1993, K. Halfpapp and S. De Faveri (1 ♀, 1 ♂, ANIC), 16 July – 18 Aug 1993, P. Zborowski and J. Balderson (1 ♂, ANIC), 18 Aug – 16 Sept 1993, P. Zborowski and S. Shattuck (6 ♀, 1 ♂, ANIC), 16 Sept – 19 Oct 1993, P. Zborowski and D. Rentz (5 ♀, ANIC; 5 ♂, CAS), 19 Oct – 18 Nov 1993, P. Zborowski and M. Horak (3 ♀, ANIC), 18 Nov – 18 Dec 1993, P. Zborowski (5 ♀, 2 ♂, ANIC), 18 Dec 1993 – 17 Jan 1994, P. Zborowski and E.D. Edwards (4 ♀, 4 ♂, ANIC); Split Rock 14 km SE Laura at 15°39'S 142°42'E, 21-26 June 1975, S.R. Monteith (1 ♂, ANIC) and 29 June – 24 Aug 1992, P. Zborowski and J.C. Cardale (18 ♀, 4 ♂, ANIC; 10 ♀, CAS); Taroom at 25°39'S 149°48'E, 9 Oct 1984, I.D. Naumann and J.C. Cardale (1 ♂, ANIC); 13 km SE Weipa at 12°40'S 143°00'E, 24 Oct – 15 Nov 1993, P. Zborowski and M. Horak (1 ♀, ANIC), and 15 Nov – 16 Dec 1993, P. Zborowski (1 ♀, ANIC); no specific locality or date, Gilbert Turner (1 ♀, BMNH).



FIGURE 959. Collecting localities of *Pison rufigaster* Pulawski, sp. nov.

*Pison rufipes* Shuckard

Figures 960-966.

*Pison rufipes* Shuckard, 1838:79, ♀. Lectotype: ♀, Australia: Van Diemen's Land, now Tasmania: no specific locality (BMNH), **present designation**, examined. – F. Smith, 1956:317 (in catalog of Hymenoptera in British Museum); Kohl, 1885:188 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1915:557 (in key to *Pison* of Tasmania), 558 (Tasmania), 1916b:596 (in key to Australian *Pison*), 602 (recognition characters; Australia: Tasmania); Williams, 1945:438 (New Caledonia); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Evans, Matthews, and Hook, 1981:221 (nest and prey); Cardale, 1985:262 (in catalog of Australian Sphecidae); Callan, 1990:22 (New Caledonia: no specific locality); K. Walker, Naumann, Austin, Taylor, and Cardale, 1992:49 (in catalog of insects of Tasmania); Naumann, 1993:185 (Australia: Queensland: Heathlands area in Cape York); Baker, 1998:173 (type origin and depository); Naumann, 1998:185 (Australia: Queensland: Musselbrook area, approximately 18°40'S 138°23'E); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia). – As *Pisonitus rufipes*, F. Smith, 1869:298 (new combination, in checklist of *Pisonitus*).

**LECTOTYPE DESIGNATION AND SPECIES IDENTITY.**— Shuckard did not give the number of the specimens examined in his original description of *Pison rufipes*, but he saw at least two, as indicated by the statement “in the collection of Mr. Westwood and my own”. I have designated as the lectotype the only specimen present in the Natural History Museum, London.

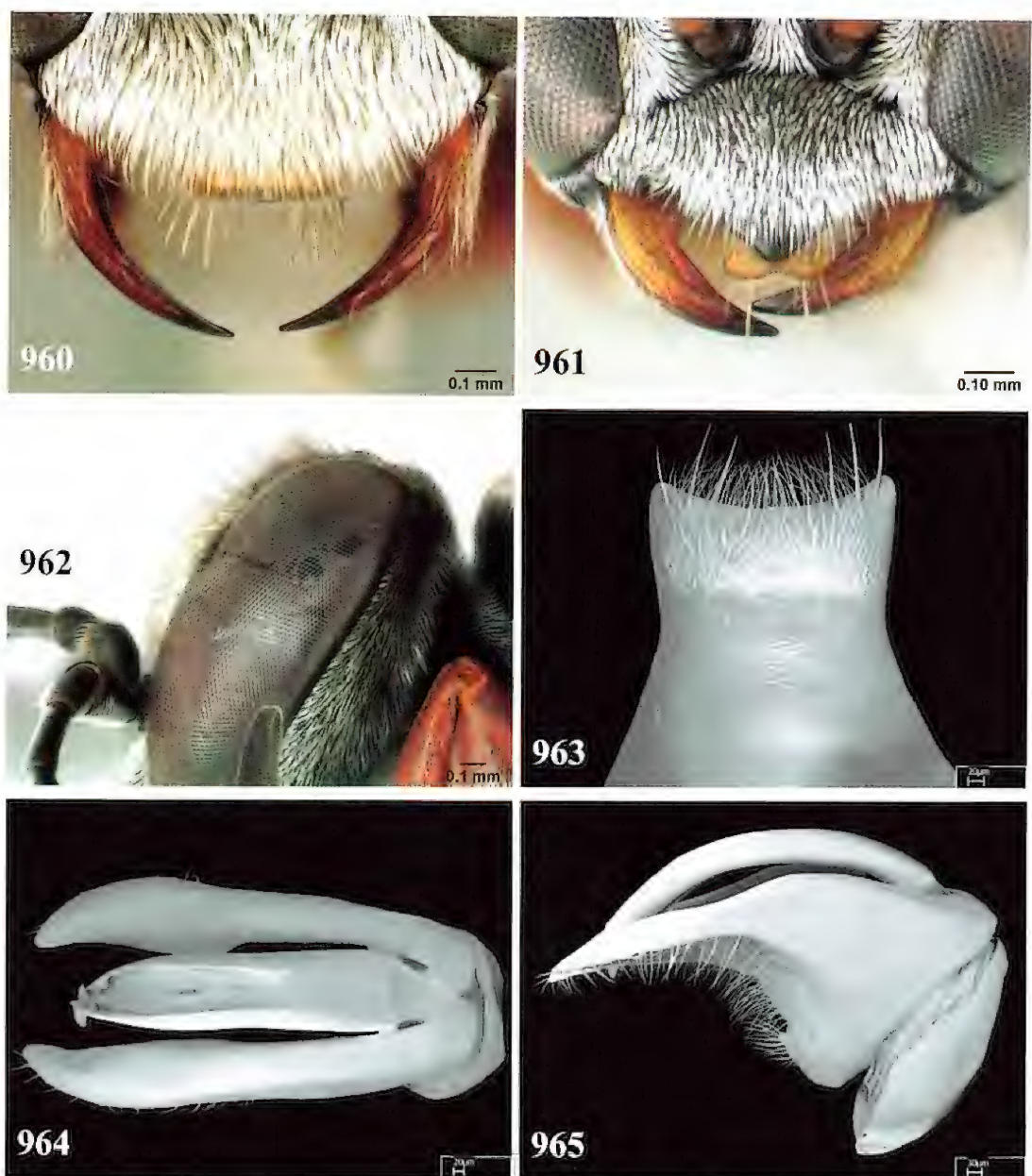
The specimen is in poor condition; in particular, the head, detached from the body and glued on a separate piece of cardboard, is that of a *Trypoxylon*, as evidenced by the emarginate eye margins in combination with a V-shaped carina above the antennal sockets and a short longitudinal carina emerging from the center of the latter. The remaining body, although partly matted by moisture, has clearly the characteristics of either *P. prostratum* or *P. rufipes* (the legs, in particular, are ferruginous). The absence of the head precludes the species recognition, but Shuckard's original description is of help. He says, in his Latin diagnosis: “Niger; mandibulis basi, palpis pedibusque rufis”, and repeats it in the English description: “Black ... The mandibles and palpi rufescent”. Since the flagellum is not listed among the rufescent body parts, it must have been black, a character of the species here treated as *rufipes*.

**RECOGNITION.**— Like *Pison argentatum* and *P. prostratum*, *P. rufipes* has the head, thorax, propodeum, and gaster all black, the second recurrent vein received near the middle of the second submarginal cell, and integument in most specimens narrowly depressed between postspiracular carina and episternal sulcus. Also, the distance between the antennal socket and orbit is slightly less than socket width, the scutal flange is slightly projecting beyond the anterior margin of the axilla, the posterior scutal margin is slightly concave next to the apex of the flange, and the propodeal dorsum is ridged.

*Pison rufipes* closely resembles *P. argentatum*, but differs in having the setae of the upper frons either erect, sinuous (Fig. 962) or suberect, bent ventrally and about as long as  $1.0\text{--}1.5 \times$  midocellar diameter (in addition to the appressed setae). In *P. argentatum*, the erect setae of the upper frons are about as long as  $0.5 \times$  midocellar diameter. In the female of *P. rufipes*, the ocellular distance is  $1.2\text{--}1.5 \times$  the hindocellar diameter (rather than  $0.8\text{--}1.1 \times$ ), the clypeal lamella is truncate or broadly obtusely angular, but exceptionally it has a minute median tooth, as in *P. argentatum*; the legs are mostly ferruginous, but exceptionally all black, as in *P. argentatum*. In the male, sternum VIII is punctate and setose well before apex (Fig. 963), whereas in *P. argentatum* it is unsculptured and asetose except near the hindmargin (Fig. 82).

Unlike *P. prostratum*, the ocellular distance of *P. rufipes* is greater than the distance between the hindocelli or equidistant, the setae of the upper frons and the interocellar area are erect or





FIGURES 960-965. *Pison rufipes* Shuckard. (960) Female clypeus and mandibles; (961) Male clypeus and mandibles; (962) Female frons in lateral view showing erect setae; male: (963) Sternum VIII (ventral surface); (964) Genitalia in dorsal view; (965) Genitalia in lateral view.

inclined ventrad (about as long as  $1.0\text{--}1.5 \times$  midocellar diameter), and the free margin of the clypeal lamella is truncate or broadly angulate in the female. In *P. prostratum*, the ocellocular distance in the vast majority of specimens is smaller than the distance between hindocelli, the setae are appressed on the upper frons and the interocellar area (in some specimens there are sparse erect setae up to  $0.5 \times$  midocellar diameter long), and the free margin of the clypeal lamella is arcuate in most females.

**DESCRIPTION.**— Frons dull, minutely punctate, punctures shallow, contiguous. Distance between antennal socket and orbit slightly less than socket width. Labrum shallowly, broadly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum at most indistinctly foveate along flange, with or without short longitudinal ridges adjacent to posterior margin; scutal and mesopleural punctures shallow, averaging less than one diameter apart; interspaces dull on scutum, shiny on mesopleuron ventrally; scutal flange slightly projecting beyond anterior margin of axilla, posterior scutal margin slightly concave next to apex of flange. Postspiracular carina present, about twice as long as midocellar diameter; integument in most specimens narrowly depressed between postspiracular carina and episternal sulcus; in some specimens, however, the depression is ill defined. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with short oblique ridges emerging from middle carina, otherwise obliquely ridged (ridges becoming larger next to lateral longitudinal carina); side ridged, punctate between ridges; posterior surface ridged. Second recurrent vein ending near middle of submarginal cell II. Posteroventral forefemoral surface microscopically, closely punctate. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I minute, less than one diameter apart. Sternum II punctate throughout, most punctures slightly more than one diameter apart.

Setae silvery, totally concealing integument on clypeus, appressed on thorax, forecoxal venter, femoral venters, and tergum I; either erect, sinuous or suberect, bent ventrad on upper frons (setal length  $1.0\text{--}1.5 \times$  midocellar diameter), also with patch of dense, appressed setae below midocellus; suberect on lower gena (setal length about  $0.7 \times$  midocellar diameter).

Head, thorax, propodeum, and gaster black, female clypeus ferruginous next to lobe free margin; mandible black basally, yellowish brown subbasally, ferruginous subapically, dark apically; antenna all black or (some males) flagellum yellowish brown ventrally. Femora, tibiae, and tarsi ferruginous in most specimens, but femora and tibiae black in some (e.g., in a female from Mount Kosciuszko National Park at 9,000 feet, 18 females and one male from Canberra and six females from Black Mountain, Australian Capital Territory, a female and a male from Orange Botanic Gardens and three females from 4 km W Sunny Corner, New South Wales, and a male from Orbost, Victoria).

♀.— Upper interocular distance equal to  $0.92\text{--}1.04 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.5 \times$  hindocellar diameter, distance between hindocelli  $0.9\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $1.02\text{--}1.04 \times$  distance between eye notches. Free margin of clypeal lamella truncate (Fig. 960). Dorsal length of flagellomere I  $2.4\text{--}2.7 \times$  apical width, of flagellomere IX  $1.1\text{--}1.2 \times$  apical width. Mandible: trimmal carina with minuscule incision at about one third of length. Length  $4.9\text{--}7.6$  mm; head width  $1.7\text{--}2.4$  mm.

♂.— Upper interocular distance equal to  $1.12\text{--}1.18 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.4 \times$  hindocellar diameter, distance between hindocelli  $1.1\text{--}1.2 \times$  hindocellar diameter; eye height equal to  $1.00\text{--}1.04 \times$  distance between eye notches. Free margin of clypeal lamella obtusely pointed in most specimens (Fig. 961), but arcuate with a round median point in some, or roundly pointed mesally and concave on each side of midpoint (as in *P. virosum*, see



Fig. 1175). Dorsal length of flagellomere I  $1.9\text{--}2.0 \times$  apical width, of flagellomere X  $0.9\text{--}1.0 \times$  apical width; venter of flagellomere III concave basally, convex preapically (inconspicuously so in small specimens). Sternum VIII shallowly, broadly emarginate apically (Fig. 963). Genitalia: Figs. 964, 965. Length 4.8–6.2 mm; head width 1.6–1.9 mm.

**NESTING HABITS.**—Evans, Matthews, and Hook (1981) found that this species had two generations near Brisbane, Queensland. They examined three nests from that area. The first two were found on roots dangling from the top of steep, overhanging earthen banks not far from water, and the third on the pendant branch of an *Acacia* tree about 1.3 m above the ground and close to water. All three were made of dried mud and were spindle-shaped, with the long axis perpendicular to the ground. They were so covered with mud on the outside that individual cells could not be discerned on the surface. The nest on a living branch differed from the other two by having the leaf bases incorporated into its body. The cells measured from 4.0 to 7.5 cm in length and about 2.0–2.5 cm in width. The third nest was dissected and found to contain 10 cells, all broadly elliptical, 6.5–8.0 mm in diameter and 8.5–12.0 mm in length. Each was separated by at least 2 mm of mud and from the outside of the nest by about 7 mm of mud. The number of spider prey varied from 4 fairly large to 9 small ones per cell. The wasp egg was laid longitudinally, laterally on the base of the opisthosoma. The spiders were all Salticidae of the following species: *Euryattus bleekeri* (Doleschall), *Jotus braccatus* L.Koch, and *Saitis nigriceps* (Keyserling), now *Maratus nigriceps* (Keyserling).

**GEOGRAPHIC DISTRIBUTION** (Fig. 966).—All Australia including Tasmania, listed from New Caledonia by Williams (1945), Callan (1990), and by Jennings, Krogmann, and Burwell (2013).

**RECORDS.**—**AUSTRALIA:** **Australian Capital Territory:** Black Mountain at  $35^{\circ}16'S$   $149^{\circ}06'E$  (1 ♀, 1 ♂, ANIC; 1 ♂, BMNH; 1 ♀, CAS; 1 ♀, UCD), Canberra (38 ♀, 5 ♂, ANIC), Cotter River at Bendora Creek (1 ♀, CAS). **New South Wales:** Armidale (1 ♂, QMB), Burrendong Botanic Garden at  $32^{\circ}42.1'S$   $149^{\circ}06.2'E$  (1 ♀, CAS), Cabramatta (1 ♂, BMNH), Cairncross State Forest 15 km N Wauchope (1 ♀, ASM), Congo 8 km SSE Moruya at  $35^{\circ}58'S$   $150^{\circ}09'E$  (2 ♀, 1 ♂, ANIC), Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (5 ♀, 3 ♂, CAS), 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$  (1 ♀, CAS), Goonoo State Forest 5 mi. S Mendooran (1 ♀, 1 ♂, AMS), Lorient Wildlife Refuge 3 km N Lansdowne near Taree (1 ♂, AMS), Mudgee (1 ♀, AMS), 40.5 km SW Narrabri at  $30^{\circ}37.7'S$   $149^{\circ}34.1'E$  (2 ♀, CAS), North Richmond (1 ♂, ANIC), Orange Botanic Garden at  $33^{\circ}15.3'S$   $149^{\circ}05.7'E$  (1 ♀, 1 ♂, CAS), Pipers Creek in Kosciuszko National Park at 9,000 feet (1 ♀, CAS), 4 km W Sunny Corner at  $33^{\circ}22.7'S$   $149^{\circ}51.6'E$  (1 ♀, CAS), Sydney (1 ♀, AMS), 23 km SE Tamworth (2 ♂, ANIC), Thirlmere Lakes National Park (1 ♀, UCD), Wahroonga (5 ♀, 3 ♂, AMS), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (1 ♂, CAS) and at  $31^{\circ}16'S$   $148^{\circ}57'E$  (1 ♀, 2 ♂, MNKB), near Warrumbungle National Park at  $31^{\circ}16.9'S$   $149^{\circ}04.8'E$  (1 ♀, CAS), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (1 ♀, CAS). **Northern Territory:** Buchanan Highway 31 km SSE Victoria Highway at  $15^{\circ}57'37''S$   $130^{\circ}38'20''E$  (1 ♂, ANIC; 2 ♀, USU), 14 km NW Cape Crawford at  $16^{\circ}34'S$   $135^{\circ}41'E$  (1 ♂, ANIC), Charles Darwin National Park in Darwin (1 ♂, NTM), Darwin (1 ♂, NTM), Gregory National Park at  $15^{\circ}36'43''S$   $130^{\circ}24'08''E$  (5 ♀, ANIC; 1 ♀, CAS; 4 ♀, 1 ♂, USU), at  $15^{\circ}44'54''S$   $129^{\circ}10'19''E$  (1 ♂, CAS), at  $15^{\circ}45'30''S$   $129^{\circ}06'28''E$  (1 ♀, ANIC; 1 ♂, USU), at  $15^{\circ}57'33''S$   $129^{\circ}01'44''E$  (1 ♀, 1 ♂, CAS), at  $15^{\circ}57'37''S$   $130^{\circ}38'20''E$  (1 ♂, ANIC), at  $15^{\circ}57'55''S$   $129^{\circ}01'52''E$  (1 ♂, ANIC), at  $16^{\circ}02.4'S$   $130^{\circ}27.3'E$  (1 ♀, USU), at  $16^{\circ}03.7'S$   $130^{\circ}27.1'E$  (1 ♀, 1 ♂, ANIC; 1 ♂, CAS; 1 ♂, USU), at  $16^{\circ}06.6'S$   $130^{\circ}25.7'E$  (1 ♀, 1 ♂, ANIC; 1 ♀, 2 ♂, CAS; 1 ♀, 3 ♂, USU), at  $16^{\circ}06.7'S$   $130^{\circ}25.4'E$  (2 ♀, 1 ♂, ANIC; 1 ♀, CAS; 4 ♀, USU), at  $16^{\circ}06'42''S$



FIGURE 966. Collecting localities of *Pison rufipes* Shuckard.

130°25'23"E (1 ♀, USU), at 16°07'55"S 130°26'11"E (2 ♀, ANIC), at 16°08.9'S 130°26.6'E (1 ♀, 2 ♂, ANIC; 2 ♂, CAS; 4 ♀, USU), at 16°09.8'S 130°26.5'E (2 ♀, ANIC), at 16°10'49"S 130°25'51"E (4 ♂, ANIC; 3 ♀, USU), and at 16°12'47"S 130°25'11"E (3 ♀, ANIC; 2 ♂, CAS; 1 ♀, 1 ♂, USU), 12 km S Kalkarindji at 17°31.2'S 130°53.8'E (2 ♀, 1 ♂, ANIC), 91 km SW Kalkarindji on Buntine Highway at 17°40'36"S 130°00'24"E (4 ♀, 4 ♂, USU), Keep River National Park at 15°44'17"S 129°06'55"E (3 ♀, 6 ♂, ANIC), 15°45'30"S 129°06'28"E (1 ♂, USU), 15°57'33"S 129°01'44"E (1 ♂, USU), 15°57'55"S 129°01'52"E (1 ♀, ANIC), 16°03'01"S 130°24'07"E (1 ♀, ANIC; 2 ♀, USU), Victoria Highway 38.5 km SW Timber Creek at 15°42'40"S 130°07'48"E (2 ♀, ANIC; 1 ♀, CAS; 1 ♀, USU), Victoria Highway 110 km WSW Timber Creek at 15°56'11"S 129°35'22"E (3 ♀, 6 ♂, USU), Victoria Highway at 16°03'22"S 129°05'15"E (3 ♂, ANIC), Virginia 31 km SE Darwin Central Business District at 12°33'S 131°02'E (4 ♀, 1 ♂, NTM), West MacDonnell National Park: Ellery Creek Big Hole 92 km W Alice Springs at 23°46.7'S 133°04.4'E (1 ♀, CAS). **Queensland:** Bald Mountain area via Emu Vale (1 ♀, QMB), Balgal Beach 51 km NW Townsville at 19°02.5'S 146°25.2'E (1 ♂, CAS), Brisbane (1 ♀, 1 ♂, QMB), Brisbane: Blunder Creek (10 ♀, 2 ♂, QMB), Brisbane: Indooroopilly (3 ♀, 1 ♂, BMNH), Brisbane: Karawatha Forest at 27°38.6'S 153°04.2'E (1 ♀, CAS), Brisbane: Mount Coot-tha (1 ♀, CAS), Bundaberg at Burnett River (1 ♂, ANIC), Bunya Mountains National Park: Horse Gully Creek (1 ♂, AMS), Carnarvon National Park at 25°04.0'S 148°14.7'E (1 ♀, CAS; 1 ♀, QMB), Cockatoo Creek at 11°39'S 142°27'E (1 ♀, ANIC), Coen at 13°57'S 143°12'E (1 ♀, 1 ♂, ANIC), Crediton State Forest at 21°11.8'S 148°29.9'E (1 ♀, 1 ♂, CAS), Dulhunty River 13 km SW Heathlands Homestead at 11°50'S 142°41'E (1 ♂, QMB), Esk (1 ♀, QMB), Eungella National Park at 21°10.5'S 148°30.3'E (3 ♀, CAS), Fletcher Creek 43 km NW Charters Towers at 19°48.9'S 146°03.3'E (1 ♀, CAS), Goomeri – Petrie Highway 17 (1 ♀, UCD), Gunshot Creek 13 km NW Heathlands Homestead at 11°43'S 141°28'E (1 ♀, QMB), Hann River at 15°11'S 143°52'E (2 ♀, ANIC), Heathlands at 11°45'S 142°35'E (2 ♀, ANIC), 12 km NE Heathlands at 11°43'S 142°41'E (2 ♀, ANIC), Homevale National Park at 21°26.9'S 148°32.4'E (1 ♀, 3 ♂, CAS), Kuranda (1 ♀, BMNH), Kuranda: Russett Park (2 ♀, CAS), Lake Monduran at 24°52.1'S 151°51.0'E (1 ♀, CAS), Lawn Hill (now Boodjamulla) National Park at 18°35'15"S 138°04'28"E (1 ♀, QMB) and 18°40'15"S 138°22'15"E (6 ♀, QMB), Maryborough at 25°32'S 152°44'E (1 ♀, ANIC), 48 km E Mount Surprise at 18°09.0'S 144°43.6'E (3 ♀, CAS), Mount Tibrogargan (3 ♀, 2 ♂, QMB), Murrays Spring 8 km NW Musselbrook Camp at 18°35'S 138°03'E (5 ♀, ANIC), Musselbrook Camp at 18°36'S 138°08'E (1 ♂, ANIC), Rocky Creek 44 km N Moreton in York Peninsula (1 ♀, ANIC), 2 km N Rokeby at 13°39'S 142°40'E (1 ♀, 1 ♂, ANIC), 61 km S Rolleston at 24°59.7'S 148°27.8'E (3 ♀, 2 ♂, CAS), Somerset Dam (4 ♀, QMB), 6 km N Taroom at 25°36'S 149°46'E (1 ♀, QMB), Townsville (1 ♀, RMNH), 13 km SE Weipa at 12°40'S 143°00'E (2 ♀, ANIC). **South Australia:** Adelaide (1 ♂, SAM), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (25 ♀, 12 ♂, CAS), 3 km ENE Wilpena at 31°31.0'S 138°36.6'E (22 ♀, 3 ♂, CAS), Wilpena Pound Gap at 31°35'S 138°36'E (1 ♀, ANIC). **Tasmania:** 3.1 km N Bronte Park (1 ♀, CAS), 12 km NNE Bronte Park at 42°02'S 146°33'E (3 ♀, ANIC), 14 km S Bronte Park at 42°15'S 146°29'E (1 ♀, 1 ♂, ANIC), Collinsville (1 ♀, BMNH), 9 km WSW Derwent Bridge at 42°10'S 146°08'E (1 ♀, ANIC), Edwards Road in Hartz Mountains at 43°07'S 146°47'E (1 ♀, ANIC), Geeveston Park (1 ♀, BMNH), 1 km SSE Gladstone at 40°58'S 148°01'E (1 ♀, ANIC), Great Pine Tier 13 km NNW Bronte Park (3 ♀, BMNH), Hobart (1 ♀, SAM), Launceston (1 ♀, ANIC), 9 km SE Miena (3 ♀, UCD), Mount Field National Park (1 ♀, ANIC; 2 ♀, BMNH), Pelion Hut 3 km S Mount Oakleigh at 41°50'S 146°03'E (1 ♀, ANIC), Poatina at 41°49'S 146°54'E (8 ♀, ANIC), 3 km ENE Wayatinah at 42°22'S 146°29'E (1 ♂, ANIC), no specific locality (1 ♀, BMNH, lectotype of *Pison rufipes*). **Victoria:** Melbourne (1 ♀, BMNH), 18 km NNW Omeo (1 ♀, ANIC), 23 mi. E Orbost (1 ♂, CAS). **Western Australia:** Boya (1 ♀, WAM), Carson escarpment at 14°49'S 126°49'E (1 ♂, ANIC), 10 km W Cobra Station at 24°10.2'S 116°23.0'E (23 ♀, 14 ♂, ANIC; 2 ♀, USU), 22 km E Cobra Station at 23°13.3'S 116°33.1'E (14 ♀, 7 ♂, USU), Fitzgerald River National Park at 33.949416°S 119.926086°E (1 ♂, MNKB), Great Northern Highway at 23°07.3'S 119°05.5'E (1 ♀, ANIC), Karijini National Park at 22°25.6'S 118°23.7'E (1 ♂, USU), at 22°26.3'S 118°22.9'E (1 ♀, ANIC), at 22°28.4'S 118°32.6'E (1 ♀, ANIC; 1 ♀, USU), and at 22°28.8'S 118°21.6'E (3 ♀, 1 ♂, ANIC), Kennedy Range National Park at 24°38.7'S 115°10.7'E (1 ♀, ANIC; 1 ♀, CAS; 1 ♀, USU), 28 km E Leonora (1 ♀, CAS), 11 km E Marble Bar at 21°09.0'S 119°51.7'E (1 ♂, ANIC), 30 km E Marble Bar at 21°11.0'S 120°01.7'E (2 ♀, ANIC; 1 ♂, USU), 63 km E Marble Bar at 21°13.0'S 120°20.2'E (3 ♀, ANIC; 1 ♂, USU), 95 km E Marble Bar at 21°16.8'S 120°36.3'E (1 ♀, USU), 104 km E Marble Bar at 21°19.1'S 120°40.3'E (4 ♀, ANIC), 133 km SW Marble Bar



at 21°41.6'S 119°04.8'E (16 ♀, 3 ♂, USU), Mount Augustus National Park at 24°18.0'S 116°47.6'E (5 ♀, 4 ♂, USU), at 24°19.2'S 116°48.9'E (1 ♀, ANIC; 1 ♀, CAS), and 24°22.8'S 116°54.2'E (1 ♀, ANIC), 65 km E Nanutarra Roadhouse at 22°27.8'S 116°02.6'E (2 ♀, ANIC), 158 km S Newman (= 9 km N Kumarina Roadhouse) at 24°37.8'S 117°36.8'E [correctly: 119°36.8'E] (3 ♀, ANIC), 24 km WNW Ophthalmia at 23°01.9'S 119°10.7'E (1 ♀, ANIC), 47 km S Pardoo Roadhouse at 20°22.7'S 120°01.3'E (1 ♀, ANIC; 1 ♂, USU), 80 km S Pardoo Roadhouse at 20°28.3'S 120°10.0'E (1 ♀, CAS), Perth: Darling Range (1 ♂, BMNH), Perth: Darlington (3 ♀, WAM), Perth: Kings Park (1 ♀, WAM), 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E (3 ♀, USU), Turner Creek 24 km W Mulega junction 121 km W Highway 95 at 24°50.7'S 118°28.9'E (1 ♂, ANIC), Walyunga National Park at 31°42'S 116°5'E (1 ♀, 1 ♂, CAS).

**NEW CALEDONIA:** Noumea (Williams, 1945; Callan, 1960).

***Pison rufotibiale* Pulawski, species nova**

Figures 967-969.

**NAME DERIVATION.**—*Rufotibiale* is derived from two Latin words: *rufus*, red, and *tibia*; with reference to the ferruginous tibiae of his species.

**RECOGNITION.**—*Pison rufotibiale* shares with *P. tibiale* and *P. vestitum* the presence of erect setae on tergum I combined with the ferruginous tibiae. The male is unknown. The female differs from *P. tibiale* in having the clypeal lamella not divided by a transverse sulcus (divided in *P. tibiale*) and the silvery setal fasciae on terga (rather than silvery with golden tinge or golden), and from that of *P. vestitum* in having the clypeus slightly convex adjacent to the lamella, the ocellocular distance equal to about  $1.3 \times$  hindocellar diameter, the mesopleural punctures compressed against each other, and the sterna minutely punctate, with the apical depression of sternum II impunctate. In *P. vestitum*, the clypeus is slightly concave adjacent to the lamella, the ocellocular distance is equal to about  $0.7\text{--}1.0 \times$  hindocellar diameter, the mesopleural punctures are separated by small interspaces, and the sterna are conspicuously punctate, with the apical depression of sternum II punctate.

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Mandible with acetabular carina. Gena narrow in dorsal view (Fig. 968). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $1.5 \times$  as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart; interspaces unsculptured. Tegula enlarged. Mesopleural punctures well defined, compressed against each other; interspaces unsculptured. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits.



FIGURES 967-968. *Pison rufotibiale* Pulawski, sp. nov., female. (967) Female clypeus and mandibles; (968) Female head in dorsal view.

Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (interspaces merging into irregular, fine ridges); side punctate, interspaces merging into minute ridges; posterior surface conspicuously, transversely ridged, punctate between punctures. Posteroventral forefemoral surface finely, closely punctate. Punctures of tergum I, anterior of apical depression, fine, averaging less than one diameter apart. Sterna minutely punctate, apical depression of sternum II impunctate.

Setae silvery, erect on upper frons (also with appressed setae there), postocellar area, lower gena, thorax, and tergum I (except posteriorly); setae of lower gena about  $2.0 \times$  as long as mid-ocellar diameter; partly concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body black, mandible ferruginous (narrowly black basally and apically), tibiae and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.70 \times$  lower interocular distance; ocellocular distance equal to  $1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 967). Dorsal length of flagellomere I  $3.0 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Tergum VI with apicomedian carina about as long as median width. Length 9.0 mm; head width 3.0 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 969).—Known from one locality in Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: 10 km W Cobra Station at  $24^{\circ}10.2'S$   $116^{\circ}23.0'E$ , 26 Apr – 10 May 2003, M.E. Irwin and F.D. Parker (ANIC).



FIGURE 969. Collecting locality of *Pison rufotibiale* Pulawski, sp. nov.

### *Pison scutatum* Pulawski, species nova

Figures 970-980.

**NAME DERIVATION.**—*Scutatum*, Latin neuter adjective derived from *scutum*; with reference to this species sparsely punctate scutum.

**RECOGNITION.**—*Pison scutatum* has an all black gaster and three submarginal cells, the second recurrent vein joining the third submarginal cell or interstitial with the second intersubmarginal vein, the hypostomal and occipital carinae not expanded, the tegula partly impunctate, with the outer margin evenly convex, gastral segment I not elongate, setae of tergum I appressed, and the female has no psammophore on the gena, mandible, and forefemur. Also, the scutum, in addition to dense appressed setae, has sparse erect or suberect setae (whose length is up to about  $1.0 \times$  mid-ocellar diameter) and well-defined punctures, the mesopleural punctures are less than one diameter apart, the propodeal dorsum and posterior surface are separated from the side by an irregular, longitudinal carina, from which transverse ridges emerge on the dorsum (ridges not longer than mid-ocellar diameter), and male sternum VIII is broadly emarginate (Fig. 979). A subsidiary recognition character is the vestiture of the propodeal dorsum: the setae, in the dorsal view, do not conceal the integument on the enclosure, but almost completely conceal it outside the enclosure (Fig. 974).



The female of *P. scutatum* can be recognized by the frons punctures about one diameter apart in combination with the scutal punctures averaging more than one diameter apart (except along the anterior and the posterior margins). The ocellocular distance equal to  $1.3-2.0 \times$  hindocellar diameter is a subsidiary recognition feature. In most other species the frons punctures are about one diameter apart or less and the scutal punctures average less than one diameter apart (in some species, several punctures near the scutum center are more than one diameter apart; in most *P. gregorii* the scutal punctures average 2-3 diameters apart, but the frons punctures are less than one diameter apart and the ocellocular distance is  $1.2 \times$  hindocellar diameter).

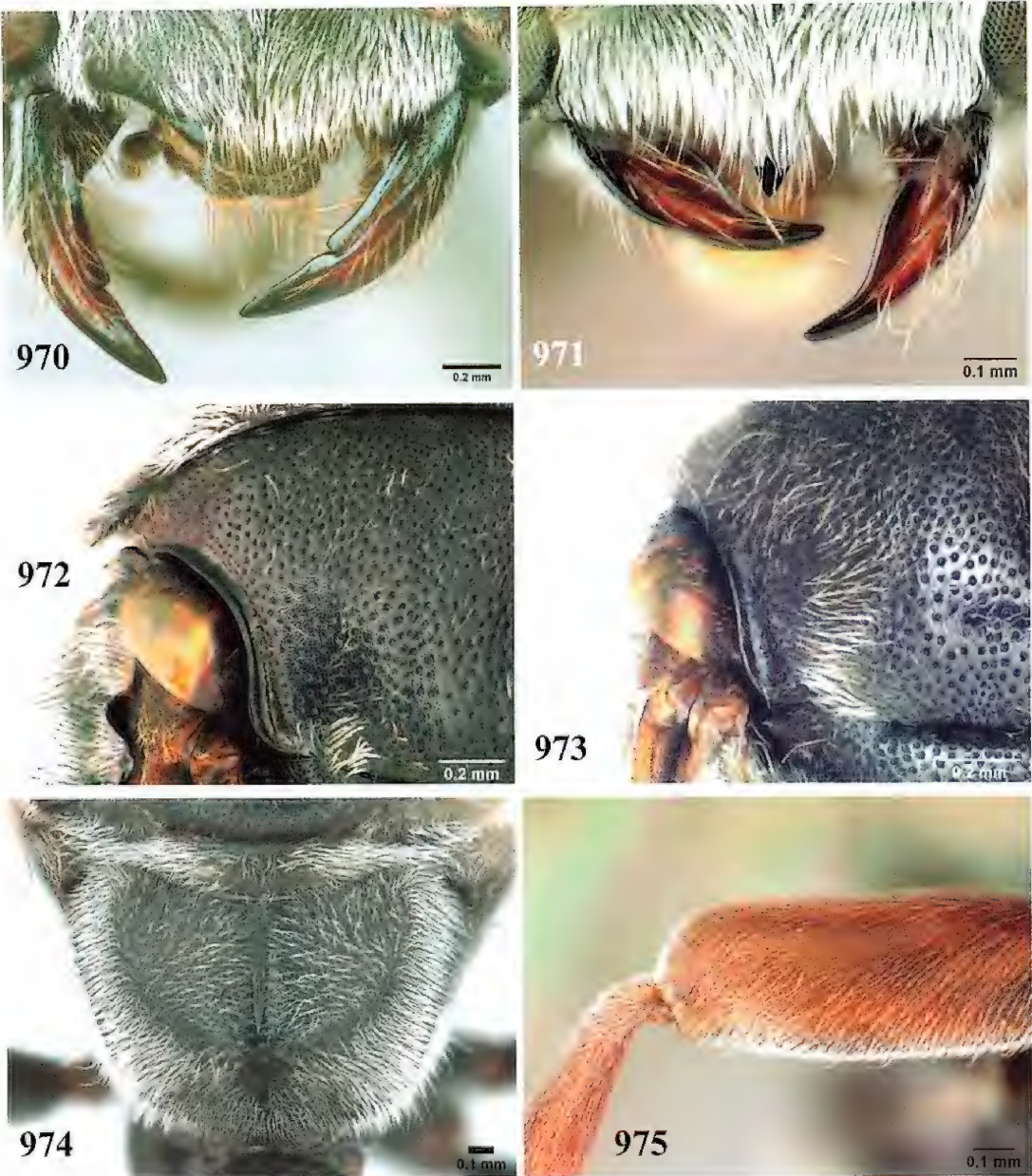
The male lacks the specializations found in many other *Pison*. For example, the dorsal length of flagellomere I is  $2.0-2.1 \times$  apical width ( $2.9-3.0 \times$  apical width in *P. novaecambriae*), the flagellomeres are not expanded ventrally and lack tyloids, the ocellocular distance is equal to  $1.8-2.4 \times$  hindocellar diameter (no more than  $0.9 \times$  hindocellar diameter in *P. separatum* and *P. formicarum*), and the propodeal dorsum is ridged and punctate (only punctate in *P. aterrimum*). Many specimens have a distinctive unsculptured, shiny preapical area on sterna III-VI, shared with *P. impressiventre*, *P. protrudens*, and many *P. decipiens*. *Pison impressiventre*, however, has a well-defined, round apicomedian impression on sterna IV-VI lacking in *P. scutatum* and the other two, and in *P. protrudens* the setae of the propodeal dorsum are unusually short, not extending over the lateral propodeal carina (extending in *P. scutatum*), the apical margin of sternum VI is concave (straight in *P. scutatum*), and sternum VII is unsculptured mesally (minutely, densely punctate in *P. scutatum*). Unlike *P. decipiens*, the scutal punctures of *P. scutatum* average more than one diameter apart (averaging less than one diameter apart to more than one diameter apart in *P. decipiens*), and the gaster is all black (either all black or the gastral base is all or partly ferruginous in *P. decipiens*).

**DESCRIPTION.**—Frons dull, minutely punctate, punctures shallow, about one diameter apart. Labrum minimally, shallowly emarginate in female, not emarginate in male. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures, on disk, averaging one diameter apart to more than one diameter in female (Fig. 972); in many males punctures are up to two or three diameters apart on disk, but in some specimens less than one diameter apart except slightly more than one diameter apart behind center (Fig. 973). Tegula enlarged, almost reaching anterior margin of axilla. Mesopleural punctures less than one diameter apart. Postspiracular carina present but inconspicuous, about  $0.4-0.6 \times$  as long as midocellar diameter. Metapleural sulcus in most specimens costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, punctate between ridges (Fig. 974); side ridged (inconspicuously so in at least ventral half) and punctate; posterior surface ridged. Punctures of horizontal part of tergum I averaging about one diameter apart, up to two diameters apart mesally in some males. Sterna punctate throughout, punctures well defined.

Setae silvery, suberect on upper frons (setal length up to about  $1.5 \times$  midocellar diameter), on lower gena varying from slightly curved to sinuous and from subappressed to suberect (setal length varying from about  $1.0$  to about  $1.5 \times$  midocellar diameter), many setae sparse and suberect to erect on scutum (setal length up to about  $1.0 \times$  midocellar diameter), appressed on tergum I.

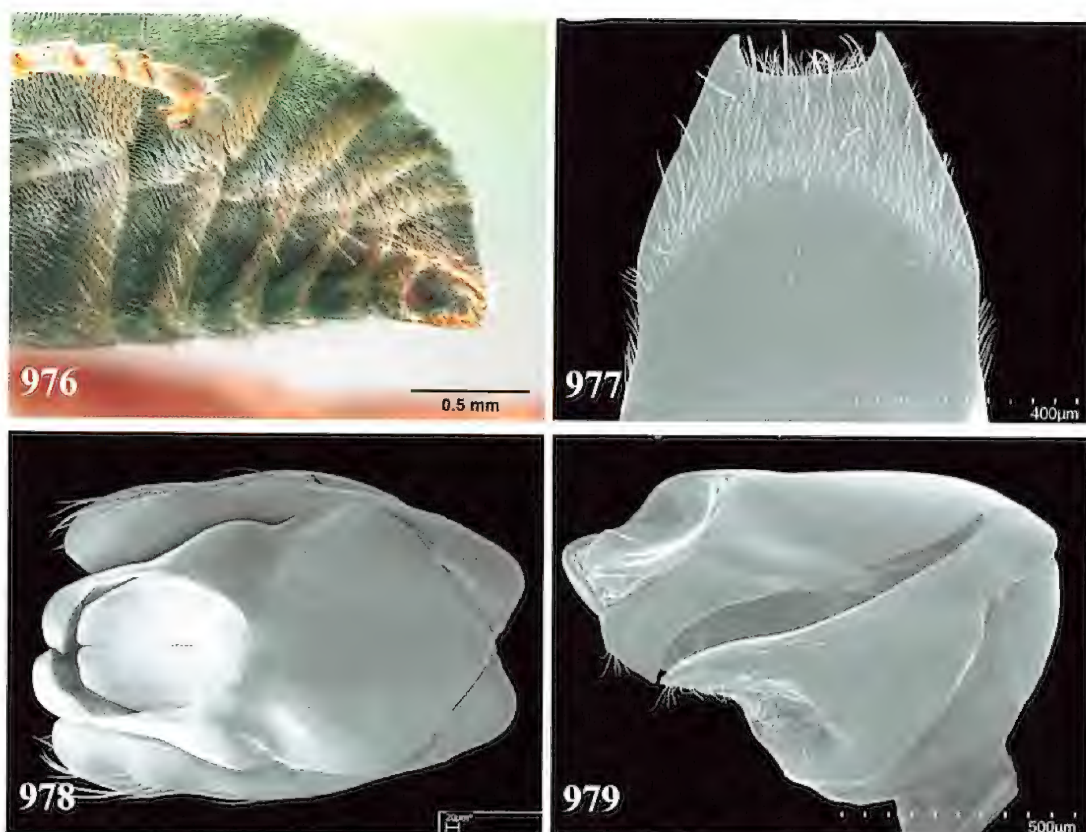
Head, thorax, propodeum, and gaster black (apical depressions of terga brown). Femora, tibiae, and tarsi all black in most females, but tibiae and tarsi partly ferruginous in some; in male, legs vary from all ferruginous to largely black.

♀.—Upper interocular distance equal to  $0.82-0.94 \times$  lower interocular distance; ocellocular distance equal to  $1.3-2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.6 \times$



FIGURES 970-975. *Pison scutatum* Pulawski, sp. nov. (970) Female clypeus and mandibles (part of setae removed); (971) Male clypeus and mandibles; (972) Female tegula and adjacent scutum; (973) Male tegula and adjacent scutum; (974) Propodeal dorsum of female; (975) Male hindfemur.





FIGURES 976-979. *Pison scutatum* Pulawski, sp. nov., male. (976) Sterna in lateral oblique view; (977) Sternum VIII (ventral surface); (978) Genitalia in dorsal view; (979) Genitalia in lateral view.

hindocellar diameter; eye height equal to  $0.88-0.96 \times$  distance between eye notches. Clypeal lamella varying both in length and width, broadly arcuate in many specimens (Fig. 970), but as long mesally as laterally in some. Dorsal length of flagellomere I  $1.8-2.2 \times$  apical width, of flagellomere IX  $1.0-1.2 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length, forming ill-defined tooth proximal to incision. Length 6.7-9.2 mm; head width 2.1-2.8 mm.

♂.— Upper interocular distance equal to  $0.88-1.10 \times$  lower interocular distance; ocellocular distance equal to  $1.8-2.4 \times$  hindocellar diameter, distance between hindocelli equal to  $1.6-1.8 \times$  hindocellar diameter; eye height equal to  $0.92-0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 971). Dorsal length of flagellomere I  $2.0-2.1 \times$  apical width, of flagellomere X  $0.9-1.0 \times$  apical width. Hindfemur thickened dorsoapically (Fig. 975). Sterna III-VI or IV-VI in many specimens with preapical, glabrous, unsculptured, shiny area (Fig. 976), but punctate throughout in some specimens; apical margin of sternum VI straight, sternum VII minutely, densely punctate; sternum VIII unsculptured basally, apical margin shallowly, broadly emarginate, slightly prominent mesally (Fig. 977). Genitalia: Figs. 978, 979. Length 5.6-7.0 mm; head width 1.9-2.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 980).— Northern Territory and Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Queensland: Split Rock 14 km SE Laura at  $15^{\circ}39'S$   $144^{\circ}31'E$ , 29 Jun – 24 Aug 1992, P. Zborowski and J.C. Cardale (ANIC).

PARATYPES: AUSTRALIA: Northern Territory: Gregory National Park at  $16^{\circ}03.7'S$   $130^{\circ}27.1'E$ ,

6-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS), at 16°06.6'S 130°25.7'E, 24 May – 5 June 2001, T. Weir, K. Pullen, and P. Bouchard (2 ♀, CAS), at 16°07'55"S 130°26'11"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 5-12 June 2001 (1 ♀, ANIC), and 16-18 June 2001 (1 ♀, ANIC). **Queensland:** 4 km NE Batavia Downs at 12°39'S 142°42'E, 18 Jun – 22 Jul 1992, P. Zborowski and S. Nielsen (3 ♀, ANIC) and 22 June – 23 Aug 1992, P. Zborowski and J.C. Cardale (2 ♀, ANIC); 5 km S Batavia Downs at 12°41'S 142°41'E, 23 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC); 7 km S Batavia Downs at 12°43'S 142°42'E, 19 Jun – 22 Jul 1992, P. Zborowski and E.S. Nielsen (1 ♀, ANIC); Coen at 13°57'S 143°12'E, 13 Sept – 20 Oct



FIGURE 980. Collecting localities of *Pison scutatum* Pulawski, sp. nov.

1993, P. Zborowski and D. Rentz (1 ♀, ANIC), 20 Oct – 16 Nov 1993, P. Zborowski and M. Horak (2 ♀, ANIC), 16 Nov – 17 Dec 1993, P. Zborowski (3 ♀, ANIC), and 17 Dec 1993 – 13 Jan 1994, P. Zborowski and E.D. Edwards (3 ♀, ANIC); Heathlands at 11°45'S 142°35'E, 15-26 Jan 1992, I.D. Naumann and T. Weir (5 ♀, ANIC), 18 Aug – 18 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC), and 8 Dec 1992 – 19 Feb 1993, P. Zborowski (1 ♀, ANIC); Lockerbie area in Cape York, 13-27 Apr 1973, S.R. Monteith (1 ♀, ANIC); 48 km E Mount Surprise at 18°09.0'S 144°43.6'E, V. Ahrens and W.J. Pulawski, 21 Nov 2012 (26 ♀, CAS) and 22 Nov 2012 (19 ♀, 2 ♂, CAS); Pinnacle Creek 27 km N Archer Crossing in Cape York, 29 June 1975, S.R. Monteith (2 ♀, CAS); Split Rock 14 km SE Laura at 15°39'S 144°31'E, 29 June – 24 Aug 1992, P. Zborowski and J.C. Cardale (10 ♀, ANIC), 28 May – 26 June 1993, P. Zborowski and I.D. Naumann (2 ♀, ANIC), 24 June – 29 Jul 1992, P. Zborowski and E.S. Nielsen (3 ♀, ANIC), 29 Jun – 24 16 Jul – 18 Aug 1993, P. Zborowski and J. Balderson (1 ♀, ANIC), 24 Aug – 21 Sept 1992, P. Zborowski and L. Miller (6 ♀, ANIC), 26 June – 16 July 1993, K. Halfpapp and S. De Feveri (1 ♀, ANIC), 30 Oct – 24 Nov 1992, P. Zborowski and A. Calder (3 ♀, ANIC), and 18 Nov – 16 Dec 1993, P. Zborowski (1 ♀, ANIC).

### *Pison separatum* F. Smith

Figures 981-988.

*Pison separatum* F. Smith, 1869:294, ♂ (as *separatus*, incorrect original termination). Lectotype: ♂, Australia: Western Australia: Champion Bay, now Geraldton (BMNH), **present designation**, examined. – Kohl, 1885:188 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*), 610 (comparison with *Pison marginatum*, as *P. separatus*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:262 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Smith did not indicate the number of specimens examined in the original description of *Pison separatum*. I have designated as lectotype the only specimen, a male of this species, labeled “W. Australia”, in The Natural History Museum, London.

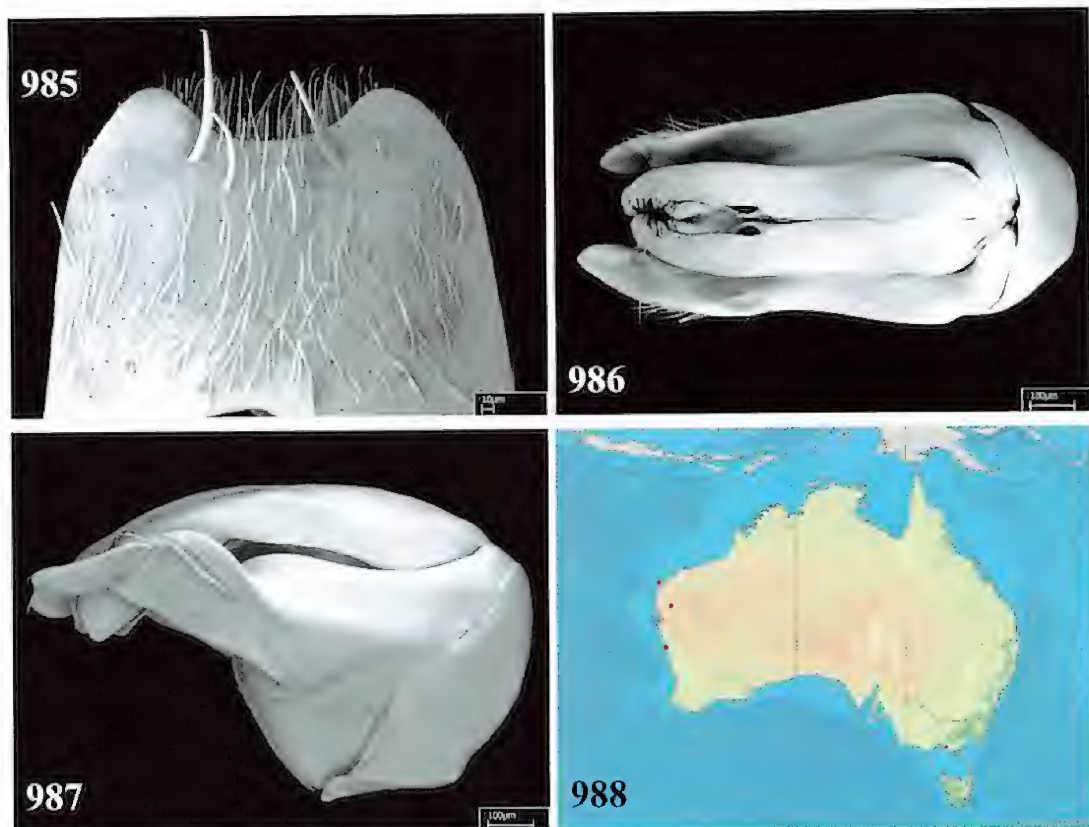
**RECOGNITION.**— The female and many males of *Pison separatum* can be instantly recognized by the unusually broad occipital carina, mesodorsally equal to  $0.5\text{--}0.9 \times$  midocellar diameter. Subsidiary recognition features are: body all black; ocellocular distance equal to about  $0.3 \times$  hindocellar diameter in female,  $0.6\text{--}0.8 \times$  in male; hypostomal carina expanded, about as wide adjacent to the mandibular base as  $0.5 \times$  midocellar diameter; setae of the lower gena sinuous, slightly longer than the midocellar diameter, scutal punctures on disk less than one diameter apart, forewing with three submarginal cells, second recurrent vein interstitial with second intersubmarginal vein or nearly so, and setae appressed on tergum I.





FIGURES 981-984. *Pison separatum* F. Smith. (981) Female clypeus and mandibles; (982) Male clypeus and mandibles; (983) Female head in dorsal view (arrow shows broad occipital carina); (984) Left wings of female.

**DESCRIPTION.**— Frons dull, punctate, punctures nearly contiguous. Occipital carina expanded except in some males, as wide dorsally as  $0.5\text{--}0.9 \times$  midocellar diameter (Fig. 983), joining hypostomal carina. Hypostomal carina expanded, adjacent to mandibular base about as wide as  $0.5 \times$  midocellar diameter. Labrum not emarginate. Gena narrow in dorsal view (Fig. 983). Anteromedian pronotal pit transversely elongate, about as long as  $1.0\text{--}1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures less than one diameter apart, interspaces unsculptured. Mesopleural punctures larger than those on scutum, less than one diameter apart, interspaces unsculptured. Tegula enlarged, near midlength punctate on more than half width. Postspiracular carina present, about  $1.0\text{--}1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent in some specimens); dorsum obliquely ridged, punctate between ridges, middle carina lacking in some specimens; side ridged, punctate between ridges; posterior surface ridged, punctate between ridges, with longitudinal, sublateral impression in ventral half. Hindcoxa dorsum with outer margin carinate only apically. Posteroventral forefemoral surface with punctures that vary from about one diameter apart to about two diameters apart in basal half. Punctures of tergum I averaging about one diameter apart on horizontal section. Sternum II finely punctate throughout (punctures 2-3 diameters apart mesally), punctures of sterna IV and V several diameters apart mesally.



FIGURES 985-987. *Pison separatum* F. Smith, male. (985) Sternum VIII (ventral surface); (986) Genitalia in dorsal view; (987) Genitalia in lateral view.

FIGURE 988. Collecting localities of *Pison separatum* F. Smith.

Setae silvery, appressed on scutum and tergum I, on lower gena erect and sinuous, about as long as midocellar diameter; largely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body all black, female wings conspicuously infumate (Fig. 984).

♀.— Upper interocular distance equal to  $0.58-0.60 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter; eye height equal to  $1.04-1.06 \times$  distance between eye notches. Free margin of clypeal lamella obtusely arcuate (Fig. 981). Dorsal length of flagellomere I  $2.7-2.9 \times$  apical width, of flagellomere IX  $1.4-1.6 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 8.8-9.7 mm; head width 2.4-2.7 mm.

♂.— Upper interocular distance equal to  $0.76-0.84 \times$  lower interocular distance; ocellocular distance equal to  $0.6-0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8-1.1 \times$  hindocellar diameter; eye height equal to  $0.98-1.06 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 982). Dorsal length of flagellomere I  $2.5-2.8 \times$  apical width, of flagellomere X  $1.2-1.3 \times$  apical width. Sternum VIII: apical margin shallowly, broadly emarginate (Fig. 985). Genitalia: Figs. 986, 987. Length 7.0-9.9 mm; head width 1.9-2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 988).— Western part of Western Australia.

**RECORDS.**— **AUSTRALIA: Western Australia:** Cape Range National Park: Mandu Mandu Creek (11 ♂, CAS), Geraldton (1 ♂, BMNH, as *Champion Bay*, lectotype of *Pison separatum*), Great Northern Highway



at 23°02.6'S 118°50.2'E (1 ♀, ANIC), Karijini National Park at 22°25.6'S 118°23.7'E (1 ♀, 1 ♂, ANIC), at 22°26.3'S 118°22.9'E (1 ♂, CAS), at 22°28.7'S 118°32.3'E (1 ♂, CAS), at 22°29.5'S 118°30.1'E (1 ♀, ANIC), Kennedy Range National Park at 24°38.7'S 115°10.7'E (2 ♀, CAS), 47 km S Mount Augustus National Park at 24°19.2'S 116°48.9'E (1 ♀, CAS), Pardoo Road House at 20°22.7'S 120°01.3'E (1 ♀, CAS).

***Pison setiferum* Pulawski, species nova**

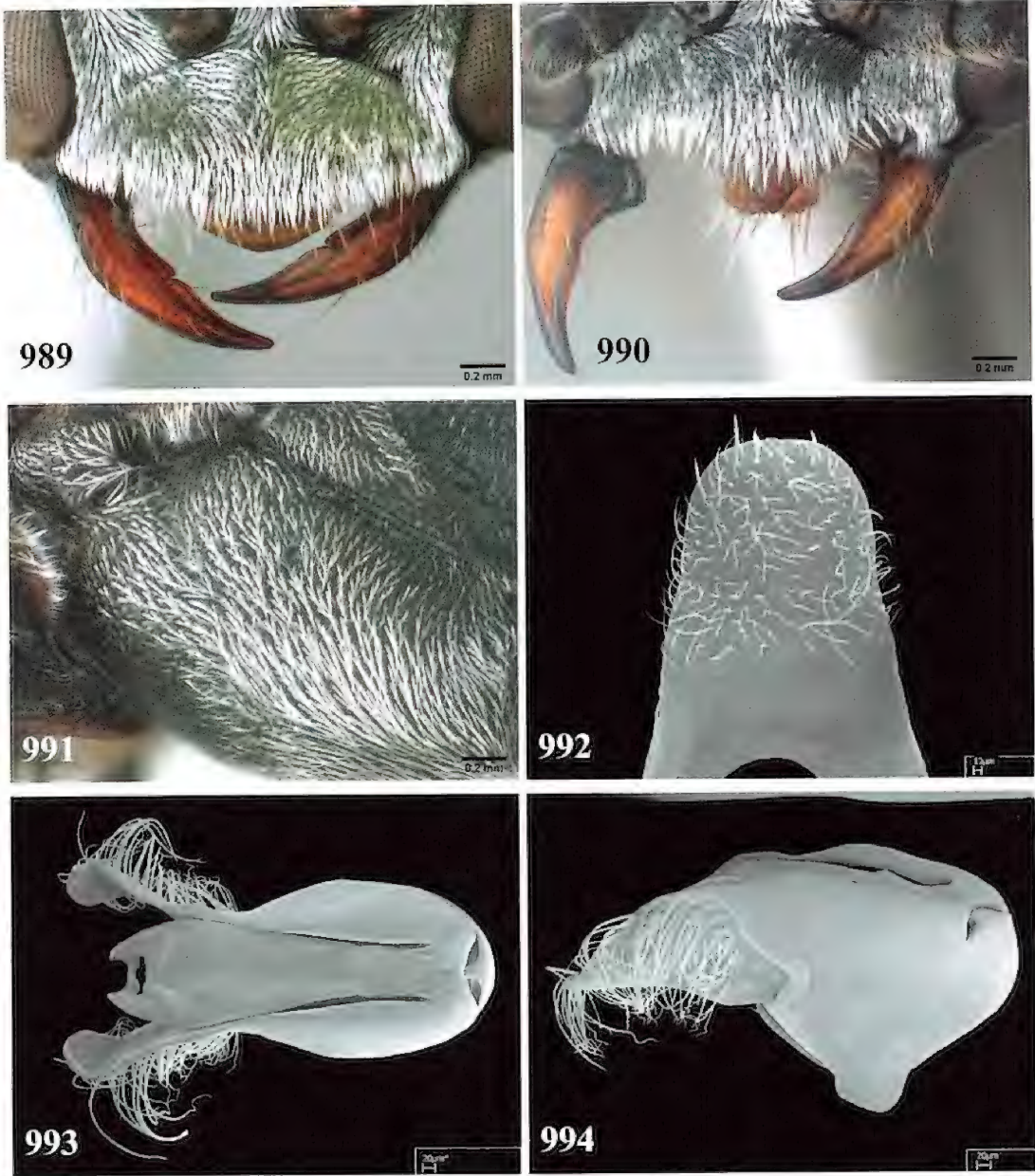
Figures 989-995.

**NAME DERIVATION.**—*Setiferum* is a Latin word consisting of *seta* and the neuter suffix *-ferum*, a bearer, meaning *setiferous*; with reference to the presence of genal, mandibular, and forefemoral psammophores in the female.

**RECOGNITION.**—*Pison setiferum* has the head, thorax, femora, tibiae, and gaster black, three submarginal cells, second recurrent vein interstitial with second intersubmarginal vein or nearly so, the mandibular apex simple (not bi- or tridentate), the propleuron densely punctate, the setae appressed on tergum I, and silvery on the frons and gaster.

The female has the lower gena impunctate and asetose on each side of the oral fossa, a psammophore adjacent to the impunctate area, and another psammophore on the forefemoral venter (although the psammophores are relatively short). It can be distinguished from similar species by the following combination: the corners of the clypeal lamella are closer to each other than to the adjacent orbit, the ocellocular distance is  $0.4\text{--}0.7 \times$  hindocellar diameter and is smaller than the distance between the hindocelli, and the setae do not conceal the integument on the propodeal dorsum. *Pison pusillum* is similar, but in *P. setiferum* the dorsal length of flagellomere I is  $2.0\text{--}2.1 \times$  apical width (rather than  $1.8 \times$ ), the setae of the ventral mandibular margin are about  $1.0 \times$  midocellar diameter (rather than about  $1.8 \times$ ), those of the upper frons are oriented dorsally (rather than ventrally), the mandible is dark reddish mesally (rather than yellowish), and the tegula does not fully cover the humeral plate. Also similar is *Pison tridentatum*, which differs in having two conspicuous preapical teeth on the inner mandibular margin (rather than simple), the setae of upper frons and the interocellar area erect or suberect and as long as  $0.4\text{--}0.6 \times$  midocellar diameter (in *P. setiferum* appressed, as long as  $0.2\text{--}0.3 \times$  midocellar diameter), the longest setae of the genal and forefemoral psammophores, respectively,  $0.5\text{--}1.0 \times$  and  $0.6\text{--}0.8 \times$  as long as the greatest forefemoral width (in *P. setiferum*  $0.4\text{--}0.6 \times$  and  $0.3\text{--}0.5 \times$ , respectively), and sterna II and III impunctate apicomesally (minutely punctate in *P. setiferum*).

In the male, the flagellum is cylindrical, without tyloids, the clypeal lamella is acutely angulate (not concave on each side of the midpoint), the scutal punctures are not compressed, the interspaces are not linear, the sterna have no unusual structures (no transverse swelling or tooth, no glabrous preapical areas, sternum VIII without median sulcus or swelling), the apical depressions of sterna II and III are punctate (punctures several diameters apart), tergum VII and sternum VII have no erect setae apicolaterally, and the apical margin of sternum VIII is evenly convex. *Pison pusillum* is similar, but *P. setiferum* differs in having the flagellomere I slightly longer (dorsal length  $2.0\text{--}2.1 \times$  apical width rather than  $1.8 \times$ ), the setae of the upper frons oriented dorsally (rather than ventrally), the mandible dark reddish mesally (yellowish mesally in many *P. pusillum*), and the tegula smaller, not covering the humeral plate (in *P. pusillum* the tegula is larger, in many forewing positions fully covering the humeral plate). Also similar is *Pison curiosum*, but in *P. setiferum* the ocellocular distance equals  $1.0 \times$  hindocellar diameter (rather than  $1.7 \times$ ), the tegula does not extend to the anterior margin of the axilla and its outer margin is convex (rather than minimally concave, almost rectilinear), and the hindtibial spurs are light (rather than black). Another similar species is *P. hirticeps*, from which *P. setiferum* differs in having only appressed, short setae on the upper frons (also with sparse, erect setae up to about  $0.8 \times$  as long as midocel-



FIGURES 989-991. *Pison setiferum* Pulawski, sp. nov. (989) Female clypeus and mandibles; (990) Male clypeus and mandibles; (991) Female mesopleuron; male: (992). Sternum VIII (ventral surface); (993) Genitalia in dorsal view; (994) Genitalia in lateral view.



lar diameter in *P. hirticeps*), in having the setae of the lower gena up to about  $1.0 \times$  as long as midocellar diameter (rather than up to about  $2.0 \times$  as long as midocellar diameter), and in having all sterna punctate throughoput (rather than sterna II-IV impunctate apicomesally).

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, nearly all less than one diameter apart. Tegula practically not enlarged. Mesopleural punctures fine, separated by linear, shiny interspaces (Fig. 991). Postspiracular carina ill defined. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with fine longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (punctures less than one diameter apart), with interspaces merging into oblique ridges (ridges well defined basally, evanescent posteriorly); side finely ridged, punctate between ridges; posterior surface transversely ridged, punctate between ridges. Punctures of tergum I less than one diameter apart on horizontal portion. Sternum II sparsely punctate apicomesally.

Setae silvery, appressed on upper frons, scutum, and tergum I, oriented dorsally on upper frons (between dorsal end of middle carina and midocellus); see below for setae of lower gena; largely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body black except mandible ferruginous mesally in most specimens, tarsal apex brown, and tibial spurs whitish; male flagellum brown ventrally to various degrees.

♀.—Upper interocular distance equal to  $0.64\text{--}0.72 \times$  lower interocular distance; ocellocular distance equal to  $0.4\text{--}0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.88\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 989). Dorsal length of flagellomere I  $2.0\text{--}2.1 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Lower gena, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal and forefemoral psammophores about  $0.4\text{--}0.6 \times$  and  $0.3\text{--}0.5 \times$ , respectively, of greatest forefemoral width), setae of posterior mandibular margin not forming psammophore, about as long as  $1.0 \times$  midocellar diameter; lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision shortly beyond midlength. Length  $5.6\text{--}6.5$  mm; head width  $1.7\text{--}2.0$  mm.

♂.—Upper interocular distance equal to  $0.80\text{--}0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.0\text{--}1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.8 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}1.00 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 990). Setae of lower gena suberect, slightly curved, length up to about one midocellar diameter. Dorsal length of flagellomere I  $1.6\text{--}1.8 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Apical margin of sternum VIII evenly rounded (Fig. 992). Genitalia: Figs. 993, 994. Length  $5.2\text{--}5.4$  mm; head width  $1.4\text{--}1.7$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 995).—Northern Territory, Western Australia.



FIGURE 995. Collecting localities of *Pison setiferum* Pulawski, sp. nov.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: Western Australia:** 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E, 24 Apr 7 May 2003, M.E. Irwin and F.D. Parker (ANIC).

**PARATYPES:** **AUSTRALIA: Northern Territory:** West MacDonnell National Park: ca 3 km W road to Simpson Gap at 23°41.8'S 133°41.7'E, C.M. Palmer, 27 Sept – 27 Oct 2006 (6 ♀, 4 ♂, CAS), 27 Nov – 27 Dec 2006 (1 ♀, NTM), 27 Mar – 27 Apr 2007 (2 ♂, NTM), 27 Apr – 27 May 2007 (1 ♀, 1 ♂, NTM), 27 Sept – 27 Oct 2007 (1 ♂, CAS; 2 ♀, 2 ♂, NTM), 27 Oct – 27 Nov 2007 (1 ♀, NTM), 27 Nov – 27 Dec 2007 (2 ♂, CAS), 27 Jan – 27 Feb 2008 (2 ♂, NTM). **Western Australia:** same data as holotype (1 ♀, CAS); Drysdale River at 15°02'S 126°55'E, 3–8 Aug 1975, I.F.B. Common and M.S. Upton (1 ♂, ANIC); Juna Downs Station at 22°52'31"S 118°31'49"E, 28 Oct – 2 Nov 2005, CVA [= Conservation Volunteers Australia] (1 ♂, AMS); Nanutarra-Wittenoom road at 22°26'8"S 117°49'56"E, 18–23 Nov 2004 (1 ♀, 1 ♂, AMS) and 16–20 Feb 2005 (1 ♂, AMS); 80 km S Pardoo Roadhouse at 20°28.3'S 120°10.0'E, 5 Jan – 14 May 2003, F.D. Parker and M.E. Irwin (1 ♀, ANIC).

***Pison setosum* Pulawski, species nova**

Figures 996–1004.

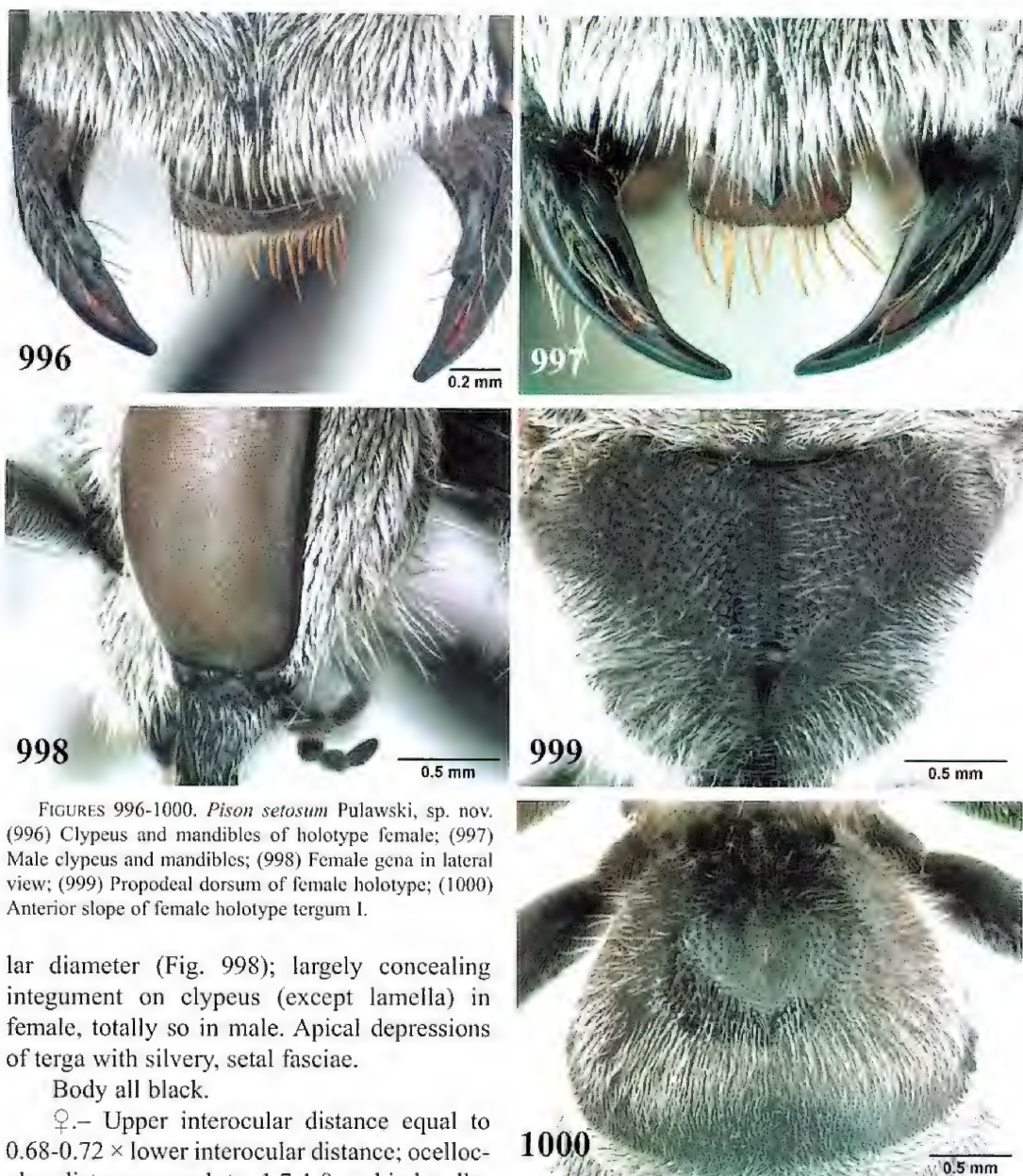
**NAME DERIVATION.**— *Setosum*, Latin neuter adjective for *setose*, with reference to the abundant, erect setae of this species.

**RECOGNITION.**— *Pison setosum* is an all black species with abundant erect setae on tergum I. Also, the posterior mandibular margin gradually curves towards the apex (not steplike), the frontal punctures are small (no more than  $0.1\text{--}0.2 \times$  midocellar diameter), the scutal punctures are less than one diameter apart anteriorly, the mesopleural punctures are less than one diameter apart, the sterna are punctate throughout (punctures of sternum II up to several diameters apart mesally, and about 1–2 diameters apart laterally), and the apical depressions of the terga are covered with silvery setae. The inclined part of tergum I has the punctures about as large as those on the scutum, about 1–2 to several diameters apart, and the ocellocular distance is  $1.7\text{--}1.8 \times$  hindocellar diameter in the female and  $1.8\text{--}2.0 \times$  in the male, markedly greater than the distance between the hindocelli. In the female, the clypeus has a well-defined lobe, with an undivided lamella (Fig. 996), the gena is punctate and setose on both sides of the oral fossa and the mandibular apex is simple (not tridentate). In the male, the flagellum is cylindrical and sternum VIII has no median sulcus and is either rounded or insignificantly emarginate apically (whereas emarginate apically or with a median projection in the other species with erect setae on tergum I).

**DESCRIPTION.**— Frons dull, punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena in female narrow in dorsal view. Labrum not emarginate. Antero-median pronotal pit transversely elongate, about as long as midocellar diameter. Scutum finely foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures of medium size, less than one diameter apart except more than one diameter apart on small area behind center; interspaces unsculptured. Tegula enlarged. Mesopleural punctures well defined, less than one diameter apart. Postspiracular carina ill defined. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum irregularly, obliquely ridged, punctate between ridges (Fig. 999); side punctate and ridged; posterior surface irregularly, transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin sharply carinate (except anteriorly). Punctures of tergum I about one diameter apart adjacent to apical depression; anterior declivity with punctures about as large as those on scutum, although markedly sparser (Fig. 1000). Sterna punctate throughout, punctures of sternum II well defined, averaging up to several diameters apart mesally, about 1–2 diameters apart laterally.

Setae silvery, erect on upper frons (in addition to appressed setae), gena, thorax, propodeum, forecoxal venter, femoral venters, and tergum I; on lower gena straight, twice as long as midocel-





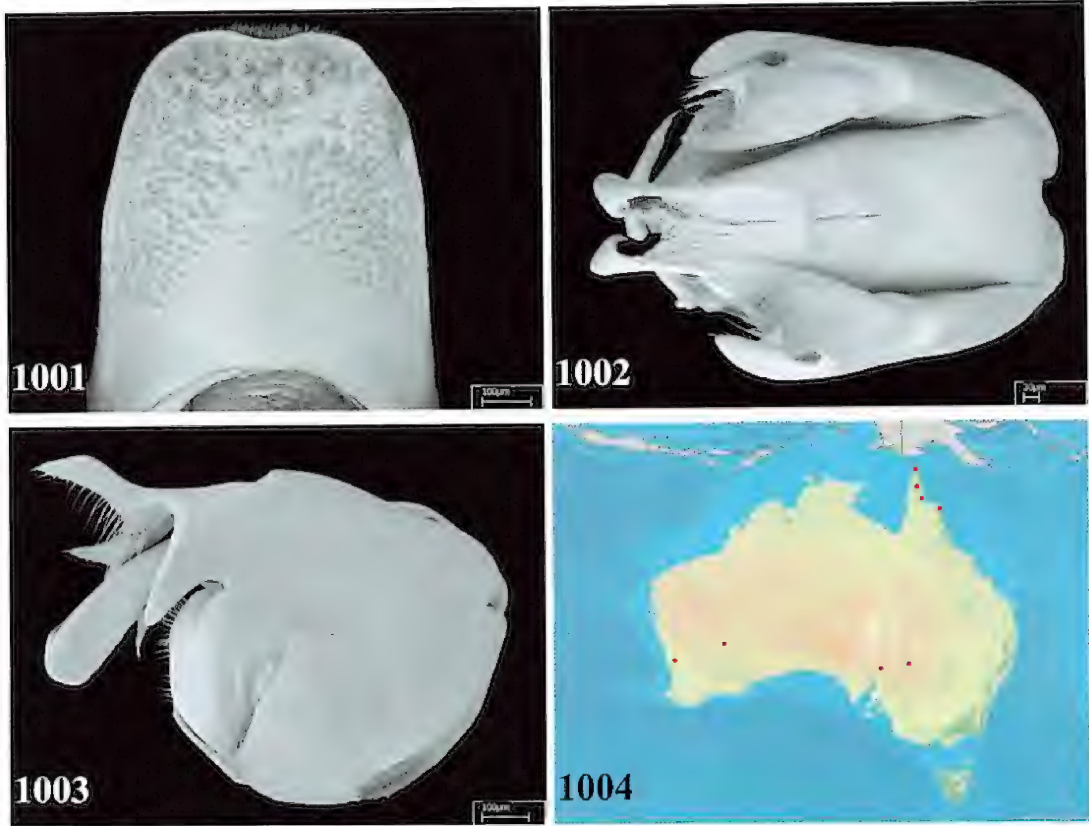
FIGURES 996-1000. *Pison setosum* Pulawski, sp. nov.  
(996) Clypeus and mandibles of holotype female; (997) Male clypeus and mandibles; (998) Female gena in lateral view; (999) Propodeal dorsum of female holotype; (1000) Anterior slope of female holotype tergum I.

lar diameter (Fig. 998); largely concealing integument on clypeus (except lamella) in female, totally so in male. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Upper interocular distance equal to  $0.68-0.72 \times$  lower interocular distance; ocellocular distance equal to  $1.7-1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.2 \times$  hindocellar diameter; eye height equal to  $0.86-0.90 \times$  distance between eye notches. Free margin of clypeal lamella broadly rounded (Fig. 996). Dorsal length of flagellomere I  $2.7-2.8 \times$  apical width, of flagellomere IX  $1.4-1.6 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 8.5-14.1 mm; head width 3.6-3.8 mm.

♂.— Upper interocular distance equal to  $0.80-0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.8-2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.1 \times$  hindocellar diameter; eye height equal to  $0.92-1.00 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 997). Dorsal length of flagellomere I  $2.3 \times$  apical width,



FIGURES 1001-1003. *Pison setosum* Pulawski, sp. nov., male. (1001) Sternum VIII (ventral surface); (1002) Genitalia in lateral view; (1003) Genitalia in dorsal view.

FIGURE 1004. Collecting localities of *Pison setosum* Pulawski, sp. nov.

of flagellomere X  $1.2 \times$  apical width. Sternum VIII punctate, its apical margin rounded or insignificantly emarginate (Fig. 1001). Genitalia: Figs. 1002, 1003. Length 9.2-10.4 mm; head width 2.6-3.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1004).— Queensland, South Australia, Western Australia

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: Queensland:** 4 km NE Batavia Downs at 12°39'S 142°42'E, 18 Jun – 22 Jul 1992, P. Zborowski and S. Nielsen (ANIC).

**PARATYPES:** **AUSTRALIA: New South Wales:** Fowlers Gap Research Station at 31°05'S 141°42'E, I.D. Naumann and J.C. Cardale (1 ♀, ANIC). **Queensland:** 4 km NE Batavia Downs at 12°39'S 142°42'E, 18 Jun – 22 Jul 1992, P. Zborowski and S. Nielsen (6 ♀, 1 ♂, ANIC), 22 Jun – 23 Aug 1992, P. Zborowski and J.C. Cardale (7 ♀, ANIC), 22 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC), and 16 Sept – 24 Oct 1992, P. Zborowski and T. Weir (1 ♀, ANIC); 7 km S Batavia Downs at 12°43'S 142°42'E, 24 May – 17 June 1992, P. Zborowski and I.D. Naumann (2 ♀, ANIC; 3 ♀, CAS); 3 km W Batavia Downs at 12°40'S 142°39'E, 18 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♀, ANIC) and 23 Aug – 16 Sept 1992, P. Zborowski and L. Miller (1 ♀, ANIC); Coen at 13°57'S 143°12'E, 20 Oct – 16 Nov 1993, P. Zborowski and M. Horak (1 ♀, ANIC); Mount Webb National Park at 15°04'S 145°07'E, 27-30 Apr 1981, I.D. Naumann (1 ♀, ANIC); 3 km NE Mount Webb, 1-3 Oct 1980, J.C. Cardale (1 ♀, ANIC); 2 km E Punsand Bay at 10°43'S 142°28'E, 17 Oct 1992, P. Zborowski and T. Weir (1 ♀, ANIC); Somerset in Cape York, 16-17 Apr 1973, S.R. Monteith (1 ♀, ANIC). **South Australia:** Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, V. Ahrens and W.J. Pulawski, 20 Dec 2010 (2 ♀, 1 ♂, CAS), 21 Dec 2010 (1 ♂, CAS), 22 Dec 2010 (1 ♂, CAS), R.M. Bohart, 5 Jan 1980 (1 ♀, UCD); 3 km ENE Wilpena at 31°31.0'S 138°36.6'E, 27 Jan 2011,



V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Western Australia:** 10 km SW Malcolm at 29°02'S 121°29'E, 12 Nov 1977, T.A. Weir (1 ♂, ANIC); Moora, 6 Nov 1979, R.M. Bohart (1 ♂, UCD).

***Pison simillimum* F. Smith**

Figures 1005-1016.

*Pison simillimum* F. Smith, 1869:292, ♂ (as *simillimus*, incorrect original termination). Lectotype: ♂, Australia: no specific locality (BMNH), **present designation**, examined. – Kohl, 1885:188 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1916b:597 (in key to Australian *Pison*), 609 (recognition characters; Australia: Victoria, as *simillimus*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:262 (in catalog of Australian Sphecidae).

*Pison meridionale* Turner, 1916b:611, ♂. Lectotype: ♂, South Australia: Adelaide (BMNH), **present designation**, examined. **New synonym.** – Turner, 1916b:598 (in key to Australian *Pison*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:260 (in catalog of Australian Sphecidae).

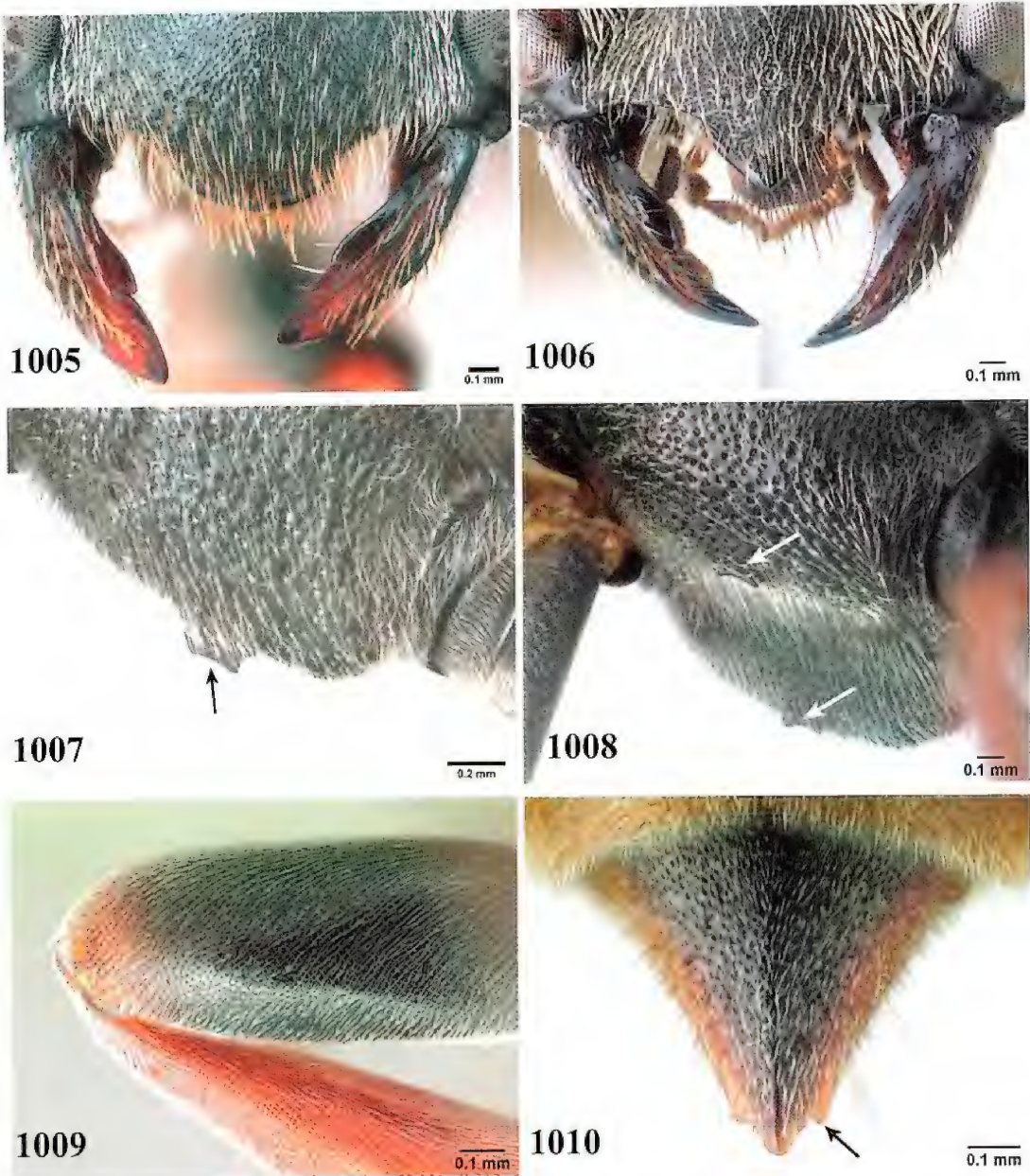
**LECTOTYPE DESIGNATIONS.**— F. Smith (1869) did not specify the number of specimens examined in the original description of *Pison simillimum*. I have selected as the lectotype of this species the only specimen in The Natural History Museum, London, a male bearing the labels "Australia", "*P. simillimus* Smith", and "F. Smith coll., type 79.22".

In his original description of *Pison meridionale*, Turner (1916b) did not indicate the number of specimens examined. I have designated as the lectotype of this species the unique specimen in The Natural History Museum, London, a male labeled "Australia" and "*Pison meridionale* Turn. Type" in Turner's handwriting.

**RECOGNITION.**— *Pison simillimum* has a black gaster (most apical setal fasciae of terga golden), three submarginal cells, second recurrent vein interstitial with second intersubmarginal vein or nearly so, and setae appressed on tergum I. The female is similar to *P. vestitum* in having an unusually short clypeal lamella, about as long mesally as laterally (Fig. 1005) and not angulate laterally, the acetabular groove with two rows of setae, and in the vast majority of specimens the tibiae and tarsi ferruginous. Unlike that species, the mesopleural punctures of *P. simillimum* are markedly larger than the scutal punctures (rather than slightly larger), the scutal setae are appressed (rather than erect or suberect), the propodeal dorsum is ridged (rather than punctate), and the setae of tergum I appressed (erect in most *P. vestitum*). Also, many females have a tridentate apical margin of tergum VI, the median tooth being larger than lateral ones and more prominent posterad. The latter character is unique within the genus.

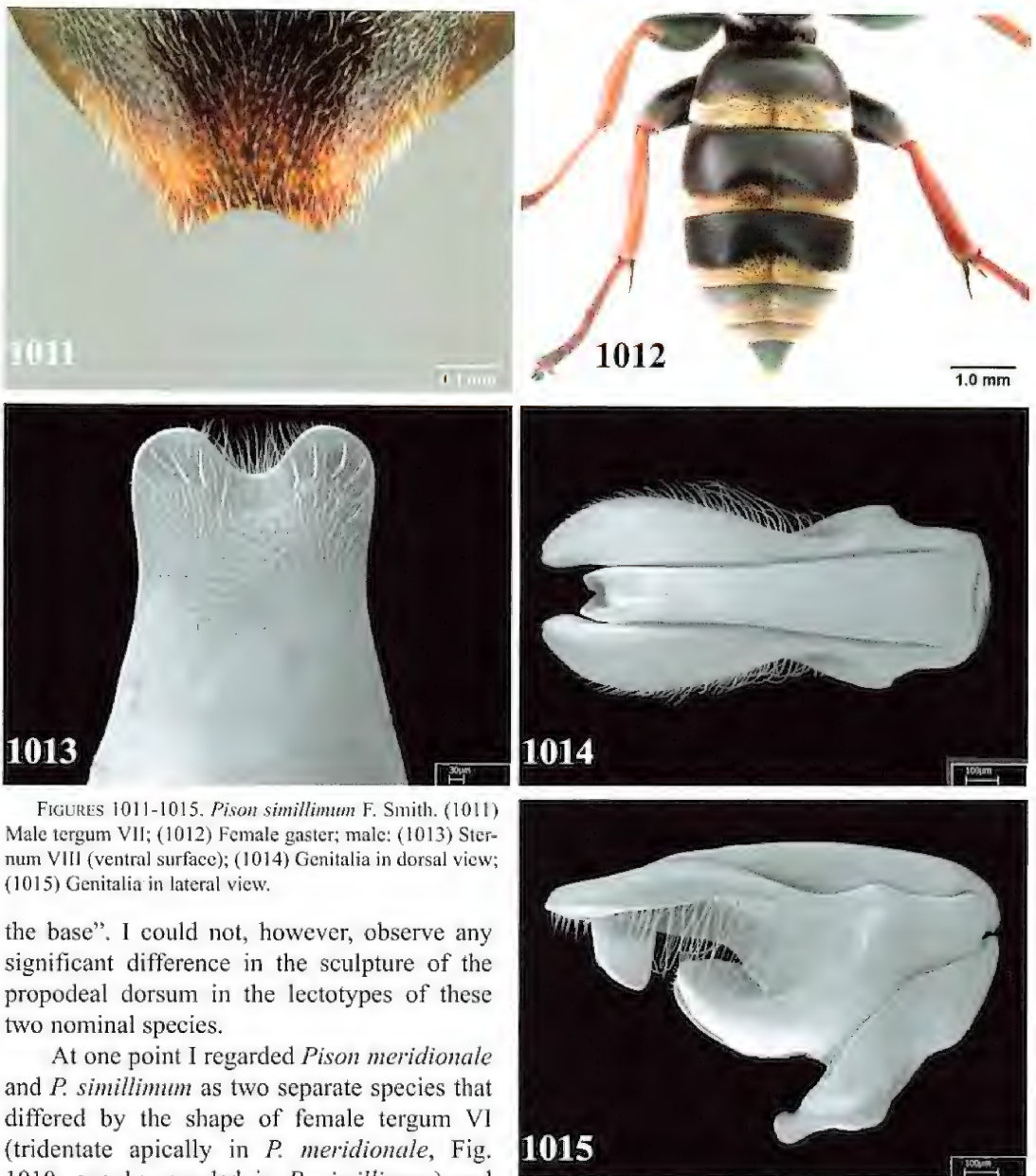
As in *P. dives* and *P. vestitum*, male tergum VII is emarginate apically (Fig. 1011). Unlike *P. dives*, the tibiae and tarsi are ferruginous in *P. simillimum* (rather than all black), the mesopleural punctures average less than one diameter apart (more than one diameter apart in *P. dives*), and the tegula is evenly rounded (in *P. dives* the anterior half of the outer margin is straight or slightly concave, markedly contrasting with the remaining margin). Unlike *P. vestitum*, the scutal punctures of *P. simillimum* are markedly smaller than the mesopleural punctures (rather than slightly smaller), the scutal setae are appressed and markedly shorter than the midocellar diameter (rather than erect or suberect, about as long as the midocellar diameter), the hindfemur is incrassate apically (rather than not incrassate), and the setae of tergum I are appressed (erect in most *P. vestitum*). In many males, the mesopleural signum is expanded into a longitudinal process (Figs. 1007, 1008), a unique such feature within the genus.

**JUSTIFICATION OF NEW SYNONYMY.**— Turner (1916b), in his key, placed *Pison simillimum* in a section of species with the "median segment [= propodeum] very distinctly obliquely striated", and *P. meridionale* in that with the "median segment punctured, sometimes striolate-punctured at



FIGURES 1005-1010. *Pison simillimum* F. Smith. (1005) Female clypeus and mandibles; (1006) Male clypeus and mandibles; (1007) Lower mesopleuron of male (arrow shows expanded signum); (1008) Mesothoracic venter of male in lateral oblique view (arrows show expanded signa); (1009) Male hindfemur and tibia; (1010) Female tergum VI (arrow shows apicolateral tooth).





FIGURES 1011-1015. *Pison simillimum* F. Smith. (1011) Male tergum VII; (1012) Female gaster; male: (1013) Sternum VIII (ventral surface); (1014) Genitalia in dorsal view; (1015) Genitalia in lateral view.

the base". I could not, however, observe any significant difference in the sculpture of the propodeal dorsum in the lectotypes of these two nominal species.

At one point I regarded *Pison meridionale* and *P. simillimum* as two separate species that differed by the shape of female tergum VI (tridentate apically in *P. meridionale*, Fig. 1010, evenly rounded in *P. simillimum*) and also by the size of the midscutal punctures in both sexes (as large or slightly larger than those on the postocellar area in *P. meridionale*, slightly smaller in *P. simillimum*). I subsequently found a female from Pigeon Rocks, Western Australia, in which the median tooth of tergum VI was absent and the lateral corner about rectangular, showing variation in the structure; in other females the lateral tooth was evanescent, thus forming a transition to the fully rounded margin. The difference in the scutal punctation did not hold either, as a female with a tridentate apical tergum had midscutal punctures smaller than those on the postocellar area. Also, male sternum VIII and the genitalia turned out to be identical.

For these reasons I regard the two names as synonyms.

**DESCRIPTION.** — Frons dull, finely punctate, punctures less than to about one diameter apart. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum at most slightly foveate along flange, with ill-defined, short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart; interspaces microsculptured, dull. Tegula slightly enlarged. Mesopleural punctures conspicuous, markedly larger than those on scutum, averaging less than one diameter apart; interspaces unsculptured, shiny. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Scutellum flat in many specimens. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with short oblique carinae emerging from middle carina, remaining surface irregularly, obliquely ridged, punctate between ridges; side with well-defined punctures, interspaces merging into small ridges; posterior surface conspicuously, irregularly ridged. Posteroventral forefemoral surface finely punctate, punctures more than one diameter apart. Hindfemur incrassate apically (more so in male than in female). Hindcoxa dorsum with outer margin sharply carinate, inner dorsal carina expanded into tooth basally. Horizontal part of tergum I with punctures about one diameter apart. Sterna punctate throughout, punctures well defined.

Setae suberect on upper frons, appressed on thorax, femora, and tergum I; straight (curved apically) on lower gena, about as long as midocellar diameter; not concealing integument on clypeus (integument easily visible in female). Apical depressions of tergum I with silvery, setal fascia, fasciae on remaining terga golden or with golden tinge (Fig. 1012).

Head, thorax, propodeum, and gaster black, female mandible ferruginous to dark ferruginous mesally, scape, pedicel and one or two basal flagellomeres dark reddish in some specimens; apical depressions of terga (except tergum I) brown. Femora black or largely ferruginous, tibiae, and tarsi ferruginous, but legs all black in specimens from Split Rock and 2 km N Rokeby, both Northern Queensland.

♀.— Upper interocular distance equal to  $0.64\text{--}0.74 \times$  lower interocular distance; ocellocular distance equal to  $0.8\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $0.96\text{--}1.0 \times$  distance between eye notches. Clypeal lamella unusually short, as long mesally as laterally, its free margin arcuate (Fig. 1005). Dorsal length of flagellomere I  $2.1\text{--}2.6 \times$  apical width, of flagellomere IX  $0.9\text{--}1.0\text{--}1.1 \times$  apical width. Mandible: trimmal carina with incision at about two thirds of length; acetabular groove with two or three rows of punctures. Apical margin of tergum VI either rounded or tridentate (Fig. 1010), median tooth mostly larger than lateral one and more prominent posterad, but minute, almost evanescent in some specimens (also lateral tooth minute, almost evanescent in some specimens). Length 8.7–15.2 mm; head width 21015–3.7 mm.

♂.— Upper interocular distance equal to  $0.78\text{--}0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.1\text{--}1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.94 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1006). Dorsal length of flagellomere I  $2.2\text{--}2.6 \times$  apical width, of flagellomere X  $1.0\text{--}1.2 \times$  apical width. Mesothoracic venter more concave than in other *Pison*, mesopleural signum in many specimens expanded into longitudinal process (Figs. 1007, 1008). Hindfemur somewhat thickened apically (Fig. 1009). Apical margin of tergum VII broadly emarginate (Fig. 1011). Sternum VIII broadly emarginate apically, apicolateral arm thick, rounded (Fig. 1013); emargination may be either markedly broader or markedly deeper than here illustrated. Genitalia: Figs. 1014, 1015. Length 7.1–12.4 mm; head width 1.9–3.5 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1016).— All Australia except Tasmania.



**RECORDS.**— **AUSTRALIA:** **Australian Capital Territory:** Black Mountain (3 ♀, 6 ♂, ANIC), Canberra (14 ♀, 6 ♂, ANIC). **New South Wales:** Australian Museum Sydney: indoors (1 ♀, AMS), Broken Hill (1 ♀, AMS), Byrock (1 ♀, AMS), Deriah Aboriginal Area 21 km E Narrabri at 30.366°S 149.992°E (1 ♂, AMS); Epping (2 ♀, AMS), Glen Innes (1 ♀, ANIC), Kinchega National Park at 32°23.7'S 142°22.7'E (2 ♀, CAS), Lane Cove, a northern suburb of Sydney (1 ♂, AMS), Nymagee (1 ♂, AMS), 50 km NW Taree (1 ♂, AMS), Tipaminka ca 24 km SSE Coonabarabran (2 ♂, AMS), Warrenburg National Park (1 ♂, UCD), Warumbungle National Park at 31°16.9'S 148°59.1'E (42 ♀, 21 ♂, CAS; 1 ♀, QMB), Willoughby, a suburb of Sydney (2 ♀, AMS), Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E (4 ♀, CAS), Woronora, southern suburb of Sydney (1 ♀, AMS). **Northern Territory:** 30 km WNW Alice Springs at 23°32'S 133°38'E (1 ♂, ANIC). **Queensland:** Ban-Ban Range (1 ♀, ANIC), Bluff Range near Biggenden (1 ♂, ANIC), Brisbane (1 ♂, QMB; 1 ♂, SAM; 1 ♀, WAM), Edungalba (1 ♀, ANIC), Eungella National Park at 21°10.5'S 148°30.3'E (6 ♀, 10 ♂, CAS), Homevale National Park at 21°26.9'S 148°32.4'E (1 ♀, 1 ♂, CAS), Lamington National Park at 28.133°S 153.133°E (1 ♀, 2 ♂, QMB), Mount Walsh National Park (1 ♀, 2 ♂, ANIC), Pendland at 20°31.0'S 145°24.2'E (5 ♀, 2 ♂, CAS), 2 km N Rokeby at 13°39'S 142°40'E (2 ♀, ANIC), Split Rock 14 km SE Laura at 15°39'S 144°31'E (17 ♀, 1 ♂, ANIC; 3 ♀, CAS), Spring Creek ca. 30 km S Bundaberg (1 ♂, ANIC). **South Australia:** Adelaide (1 ♂, BMNH, lectotype of *Pison meridionale*, 1 ♀, SAM), Bunyeroo Creek at 31°25'S 138°34'E (1 ♀, ANIC), Kings Mill Creek near Arkaroola (1 ♂, SAM), Murray River (1 ♀, SAM), 79 km NNW Renmark at 33°31'S 140°24'E (1 ♂, ANIC), Rostrevor, a suburb of Adelaide (1 ♂, AMNH), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (39 ♀, 12 ♂, CAS), 3 km ENE Wilpena at 31°31.0'S 138°36.6'E (6 ♀, 1 ♂, CAS). **Victoria:** Lake Hattah (2 ♀, 2 ♂, BMNH), no specific locality (1 ♀, BMNH). **Western Australia:** Gill Pinnacle (1 ♀, SAM); Perth (1 ♂, WAM), Pigeon Rocks at 29°55'S 119°16'E (6 ♀, 2 ♂, WAM), Tallering Station in South Murchison (1 ♀, WAM), Tumba (1 ♀, QMB). **No specific locality:** 1 ♂, BMNH, lectotype of *Pison simillimum*.



Figure 1016. Collecting localities of *Pison simillimum* F. Smith.

***Pison simplex* Pulawski, species nova**

Figures 1017-1020.

**NAME DERIVATION.**— *Simplex* is a Latin adjective meaning *simple*; with reference to the lack of specialized structures in this species.

**RECOGNITION.**— *Pison simplex* is an all black species (tarsi ferruginous in some specimens), with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal cell or nearly so, the tegula unsculptured except anteriorly, rounded apically, and not particularly elongate, and the propodeum with a longitudinal carina separating the dorsum and posterior surface from the side and extending from the gastropodeal articulation toward the spiracle. The setae of tergum I are either all appressed or suberect on the top of the anterior declivity, shorter than the midocellar diameter. The male is unknown. The female is mainly characterized by the absence of specializations found elsewhere. So, the clypeal middle section is slightly, evenly convex, the clypeal lobe is well differentiated, the clypeal lamella is obtusely rounded, the occipital and the hypostomal carinae are not expanded, the punctures of the frons are less than one diameter apart, the mesopleural punctures are nearly compressed, the propodeal dorsum is obliquely ridged, punctate between rides; tergum I is not elongate (length less than apical width), the sterna are punctate throughout, the setae of the lower gena are sinuous, as long as 1.2-1.6 × midocellar diameter, the



1018



FIGURES 1017-1019. *Pison simplex* Pulawski, sp. nov., female. (1017) Clypeus and mandibles (part of setae have been removed); (1018) Tegula and adjacent scutum; (1019) Posterior surface of propodeum in lateral oblique view.

body setae are silvery, the female gena is punctate on each side of the oral fossa and the psammophores are absent, the ocellocular distance is equal to  $1.2-1.3 \times$  hindocellar diameter. The female resembles *P. angulare* and *P. xanthognathos*. In *P. simplex*, however, several to many midscutal punctures are more than one diameter apart and the propodeal posterior surface

has several conspicuous ridges radiating up from transverse carina just above the gastropodeal articulation, whereas in the other two species all scutal punctures are less than one diameter apart and the propodeal posterior surface has no radiating ridges. Also, in *P. xanthognathos*, the longitudinal carina of the propodeum that separates the dorsum and the posterior surface from the side is replaced by a series of short, transverse carinae, whereas in *P. simplex* the carina is well defined.

**DESCRIPTION.**—Frons dull, with moderately well defined punctures less than one diameter apart. Labrum not emarginate. Anteromedian pronotal pit oval, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, most of them less than one diameter apart (Fig. 1018), but several to many midscutal punctures behind center more than one diameter apart; interspaces unsculptured. Tegula enlarged. Mesopleural punctures well defined, nearly compressed against each other. Postspiracular carina evanescent, about half as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged; side ridged, punctate between ridges; posterior surface conspicuously, transversely ridged (Fig. 1019), with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Hindcoxal dorsum with outer margin obtusely carinate. Punctures of tergum I about one diameter apart on horizontal portion (nearly compressed on apical depression). Sterna punctate throughout.

Setae silvery, erect on scutum, not concealing integument on clypeus; setae of tergum I appressed in many specimens, but in some specimens suberect, shorter than midocellar diameter



on top of anterior declivity; setae of lower gena sinuous,  $1.2\text{--}1.6 \times$  midocellar diameter in length. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible ferruginous mesally, tarsi ferruginous in some specimens (all or partly).

♀.— Upper interocular distance equal to  $0.90\text{--}0.94 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $0.88\text{--}0.90 \times$  distance between eye notches. Free margin of clypeal lamella obtusely rounded (Fig. 1017). Dorsal length of flagellomere I  $2.2\text{--}2.4 \times$  apical width, of flagellomere IX  $1.1\text{--}1.3 \times$  apical width. Mandible: trimmal carina with preapical tooth at about two thirds of length. Length  $6.8\text{--}8.0$  mm; head width  $1.1\text{--}1.4$  mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1020).—

Northern parts of Northern Territory and of Queensland.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: Northern Territory: Gregory National Park at  $16^{\circ}07'55''\text{S}$   $130^{\circ}26'11''\text{E}$ , 16–18 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

PARATYPES: AUSTRALIA: Northern Territory: Buchanan Highway 31 km SSE Victoria Highway at  $15^{\circ}57'37''\text{S}$   $130^{\circ}38'20''\text{E}$ , 14–15 June 2001 (1 ♀, ANIC), 15 June 2001, M.E. Irwin and F.D. Parker (1 ♀, ANIC; 2 ♀, CAS), 18–19 June 2001 (1 ♀, CAS); Gregory National Park, T. Weir, K. Pullen, and P. Bouchard at  $15^{\circ}58.3'\text{S}$   $130^{\circ}29.3'\text{E}$ , 6–9 June 2001 (1 ♀, ANIC; 1 ♀, CAS), at  $15^{\circ}58'17''\text{S}$   $130^{\circ}29'17''\text{E}$ , 24 May – 4 June 2001 (1 ♀, CAS), at  $16^{\circ}03'44''\text{S}$   $130^{\circ}27'04''\text{E}$ , 24 May – 4 June 2001 (2 ♀, CAS),  $16^{\circ}03.7'\text{S}$   $130^{\circ}27.1'\text{E}$ , 24 May – 4 June 2001 (3 ♀, ANIC; 2 ♀, CAS), and at  $16^{\circ}06'42''\text{S}$   $130^{\circ}25'23''\text{E}$ , 24 May – 5 June 2001 (2 ♀, CAS), and M.E. Irwin, F.D. Parker, and C. Lambkin at  $16^{\circ}03.7'\text{S}$   $130^{\circ}27.1'\text{E}$ , 6–12 June 2001 (4 ♀, CAS), at  $16^{\circ}06.6'\text{S}$   $130^{\circ}25.7'\text{E}$ , 24 May – 4 June 2001 (1 ♀, ANIC), at  $16^{\circ}07'55''\text{S}$   $130^{\circ}26'11''\text{E}$ , 16–18 June 2001 (2 ♀, ANIC; 3 ♀, CAS), and at  $16^{\circ}12'47''\text{S}$   $130^{\circ}25'11''\text{E}$ , 12–15 June 2001 (1 ♀, CAS). QUEENSLAND: 4 km NE Batavia Downs at  $12^{\circ}39'\text{S}$   $142^{\circ}42'\text{E}$ , 22 June to 23 Aug 1992, P. Zborowski and J.C. Cardale (5 ♀, ANIC).



FIGURE 1020. Collecting localities of *Pison simplex* Pulawski, sp. nov.

### *Pison simulans* Turner

Figures 1021–1030.

*Pison simulans* Turner, 1915:559, ♂. Lectotype, ♂, Australia: Tasmania: Eaglehawk Neck (BMNH), **present designation**, examined. — Turner, 1915:557 (in key to *Pison* of Tasmania), 1916b:596 (in key to *Pison* of Australia), 600 (recognition characters); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:262 (in catalog of Australian Sphecidae); K. Walker, Naumann, Austin, Taylor, and Cardale, 1992:49 (in catalog of insects of Tasmania).

**LECTOTYPE DESIGNATION.**— Turner (1915) did not indicated the number of the specimens examined in the original description of *Pison simulans*. I have selected as the lectotype of this species the only specimen in the BMNH. It is labeled “Eaglehawk Neck, S.E. Tasmania: Feb. 12 – Mch. 3, 1913, R.E. Turner” (printed) and “*Pison* (*Parapison*) *simulans* Turn., Type” (handwritten).

**RECOGNITION.**— *Pison simulans* has only two submarginal cells, the second one elongate (length of posterior margin  $1.9\text{--}2.3 \times$  its height), the clypeal free margin with a well-defined median lobe and in the vast majority of specimens with an obtuse median point in both sexes, concave on each side of the point (Figs. 1021, 1022), the ocellocular distance equal to or greater than the



FIGURES 1021-1026. *Pison simulans* Turner. (1021) Female clypeus and mandibles; (1022) Male clypeus and mandibles; (1023) Female pronotum in dorsal view; (1024) Female pronotum in lateral view; (1025) Female sternum II; (1026) Apical sterna of male in profile.





FIGURES 1027-1029. *Pison simulans* Turner, male.  
(1027) Sternum VIII (ventral surface); (1028) Genitalia in  
dorsal view; (1029) Genitalia in lateral view.

hindocellar diameter, a partly impunctate tegula, the propodeum with a longitudinal carina separating the side from the dorsum and posterior surface and extending from the gastral socket area toward the spiracle, the length of tergum I smaller than the apical width. It closely resembles *P. erythrocerum* and *P. erythrogastrum*, but differs in having the femora black (except ferruginous apically). In the other two species, the femora are all or largely ferruginous. Also, the pronotal collar of *P. simulans* is longer dorsally (Figs. 1023, 1024) than in *P. erythrocerum* and most *P. erythrogastrum*, the gaster is all black (ferruginous in many *P. erythrogastrum*, at least partly so), and the forefemur is somewhat swollen (not swollen in *P. erythrogastrum*).

**DESCRIPTION.**—Frons dull, finely punctate, punctures less than one diameter apart, middle supraantennal carina replaced by fine sulcus. Labrum narrowly emarginate. Dorsum of pronotal collar elongate (Figs. 1023, 1024). Anteromedian pronotal pit varying from rounded, about half length of midocellar diameter in width, to transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged. Mesopleural punctures fine, about one diameter apart or up to about two diameters apart in some specimens. Postspiracular carina absent. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with oblique ridges emerging from middle carina (ridges well defined next to midline, gradually effacing toward side), punctate between ridges; side slightly concave, ridged (ridges effaced posteriorly), punctate between ridges; posterior surface punctate on each side of median sulcus. Forewing with two submarginal cells; posterior margin of second submarginal cell  $1.9\text{--}2.3 \times$  its height. Forefemur somewhat swollen. Gaster with well-defined constriction between terga I and II. Punctures of tergum I small but well defined, about one diameter apart. Sternum II with well-defined punctures that average 2-3 diameters apart mesally (Fig. 1025), impunctate apico-mesally in some specimens.

Setae silvery, appressed on gena, thorax, forecoxal venter, femoral venters, and tergum I, largely concealing integument on clypeus in female, completely so in male; short, oriented dorsally between dorsal end of midfrontal sulcus and midocellus, oriented ventrad adjacent to midocellus. Apical depressions of terga with inconspicuous setal fasciae.

Head, thorax, propodeum, and gaster black, mandible black basally, yellowish mesally, dark apically; flagellum black dorsally, brown ventrally (apical flagellomeres all black in some specimens). Femora black, ferruginous apically, tibiae and tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.0\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3 \times$  hindocellar diameter; eye height equal to  $1.12 \times$  distance between eye notches. Free margin of clypeal lamella with obtuse median point (Fig. 1021), but point absent in one female from Sandy Bay, Hobart, Tasmania. Dorsal length of flagellomere I  $1.2\text{--}1.4 \times$  apical width, of flagellomere IX  $0.8\text{--}0.9 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Posteroventral forefemoral surface minutely punctate, punctures up to several diameters apart. Length  $8.2\text{--}9.0$  mm; head width  $1.9\text{--}2.1$  mm.

♂.—Upper interocular distance equal to  $0.96 \times$  lower interocular distance; ocellocular distance equal to  $1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.6 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella rounded mesally, concave on each side of midpoint (Fig. 1022). Dorsal length of flagellomere I  $1.4 \times$  apical width, of flagellomere X  $0.8 \times$  apical width. Apical sterna with sparse but conspicuous erect setae (Fig. 1026), sternum VIII shallowly, broadly emarginate (Fig. 1027). Genitalia: Figs. 1028, 1029. Length  $6.2\text{--}7.0$  mm; head width  $1.6\text{--}1.9$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1030).—Australian Capital Territory, eastern New South Wales, eastern Queensland, southern South Australia, Tasmania, Victoria.

**RECORDS.— AUSTRALIA:** **Australian Capital Territory:** Black Mountain at  $35^{\circ}16'S$   $149^{\circ}06'E$  (2 ♀, 3 ♂, ANIC; 1 ♂, BMNH; 9 ♀, 1 ♂, CAS; 1 ♀, 1 ♂, UCD), Farrer, southern suburb of Canberra at  $35^{\circ}22'S$   $149^{\circ}05'E$  (1 ♀, 2 ♂, ANIC). **New South Wales:** 3 km NE Bilpin (1 ♀, AMS), 6 km NE Bilpin (1 ♀, AMS), Bondi State Forest (1 ♀, AMS), Cecil Hoskins Nature Reserve 2 km N Moss Vale (1 ♀, ANIC), Clarence in Blue Mountains (2 ♀, AMS), Dorrigo (1 ♀, SAM), Doyles River 50 km NW Taree at  $31^{\circ}31'S$   $152^{\circ}14'E$  (8 ♀, 2 ♂, AMS), Lake George Cullerin (4 ♀, 6 ♂, UCD), Lorien Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (1 ♀, AMS), Mount Tomah in Blue Mountains (10 ♀, 3 ♂, AMS), Nadgee Nature Reserve 10 km S Newton's Beach (10 ♀, 3 ♂, ANIC), Narrow Neck near Katoomba (1 ♀, AMS), Paddys River (1 ♂, BMNH), 4 km W Sunny Corner at  $33^{\circ}22.7'S$   $149^{\circ}51.6'E$  (5 ♀, 1 ♂, CAS), Urila 26 km S Queanbeyan (1 ♂, CAS), Warrenburg National Park (1 ♂, UCD). **Queensland:** Carnarvon National Park at  $25^{\circ}04.0'S$   $148^{\circ}14.7'E$  (1 ♀, CAS); Mount Wilson Tableland at  $16^{\circ}16'S$   $145^{\circ}02'E$  (1 ♀, ANIC), Tully – Yabulu Highway (1 ♀, UCD). **South Australia:** Kangaroo Island: Gosse area (1 ♂, BMNH), 5 km S Mylor (1 ♀, BMNH). **Tasmania:** Barrow Creek 8 km NE Nunamara at  $41^{\circ}21'S$   $147^{\circ}22'E$  (3 ♀, 3 ♂, ANIC), 15 km ENE Cranbrook at  $41^{\circ}57'S$   $148^{\circ}14'E$  (1 ♀, ANIC), Eaglehawk Neck (1 ♂, BMNH, lectotype of *Pison simulans*), Edwards Road in Hartz Mountains (1 ♀, ANIC), 1 km SSE Gladstone at  $40^{\circ}58'S$   $148^{\circ}01'E$  (1 ♀, ANIC), 1 km NE Herrick at  $41^{\circ}06'S$   $147^{\circ}53'E$  (1 ♀, ANIC), Hobart: Sandy Bay (2 ♀, ANIC; 2 ♂, CAS), Intake Bridge at  $41^{\circ}19'S$   $147^{\circ}56'E$  (1 ♀, ANIC), Launceston (1 ♀, SAM), Launceston: Newstead (1 ♀, 1 ♂,



FIGURE 1030. Collecting localities of *Pison simulans* Turner.



ANIC), Mount Arthur (1 ♀, 1 ♂, SAM), Mount Field National Park at 42°40'S 146°41'E (2 ♂, QMB), Mount William National Park (1 ♀, QMB), Pelion Hut 3 km S Mount Oakleigh at 41°50'S 146°03'E (1 ♀, ANIC), Picton River bridge (1 ♀, CAS), Poatina Headrace Adit at 41°49'S 146°54'E (2 ♀, ANIC), 8 mi. W Upper Blessington (1 ♀, QMB), Wayatinah at 42°22'S 146°29'E (1 ♀, ANIC). **Victoria:** Mallacoota (1 ♀, AMNH), Shepparton (1 ♂, QMB).

***Pison sinuosum* Pulawski, species nova**

Figures 1031-1032.

**NAME DERIVATION.**— *Sinuosum* is a Latin neuter adjective meaning *curved*, *sinuous*; with reference to the shape of the female clypeal free margin.

**RECOGNITION.**— *Pison sinuosum* has three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. The female (the male is unknown) is characterized by the clypeus practically not differentiated into the median lobe and lateral section, its free margin forming almost an even arch from one orbit to the other (Fig. 1031). The species closely resembles *P. laterirugosum*, from which it differs in having the mesopleural punctures about two diameters apart near center (rather than less than one diameter apart), the propodeal dorsum with inconspicuous ridges laterally (rather than conspicuous), and the ocellocular distance equal to one midocellar diameter (rather than 0.7 ×). Also similar are *Pison longulum* and *P. rotundum*, but in those species the clypeal free margin is evenly arcuate, whereas in *P. sinuosum* the lateral portion of the free margin is minimally concave (Fig. 1131).

**DESCRIPTION.**— Frons finely, shallowly punctate, punctures averaging about one diameter apart; interspaces conspicuously microsculptured. Hypostomal carina slightly expanded, about 0.3 × as high as midocellar diameter. Gena narrow in dorsal view. Labrum minimally, shallowly emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Most punctures of propleuron more than one diameter apart. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, shallow, about one diameter apart on disk, less than one diameter apart near margins. Tegula not enlarged. Mesopleural punctures shallow, about two diameters apart at center. Postspiracular carina present, about 1.5 × as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, obliquely ridged; side finely ridged, minutely punctate between ridges; posterior surface with well-



1031



1032

FIGURE 1031. *Pison sinuosum* Pulawski, sp. nov., female. (1029) Clypeus and mandibles.

FIGURE 1032. Collecting locality of *Pison sinuosum* Pulawski, sp. nov.

defined, transverse ridges. Posteroventral forefemoral surface finely punctate, punctures averaging about 1-2 diameters apart. Hindcoxa dorsum with outer margin obtusely carinate. Punctures of tergum I, in middle of horizontal part (and before apical depression), averaging about 2-3 diameters apart. Punctures of sternum II well defined, averaging about 2-3 diameters apart along midline, apical depression impunctate at center.

Setae silvery, appressed on frons, scutum, and tergum I, oriented ventrally between dorsal end of middle carina and midocellus; on lower gena suberect, curved, slightly shorter than midocellar diameter; concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body black, mandible dark ferruginous except black basally, tarsal apex brown.

♀.—Upper interocular distance equal to  $0.72 \times$  lower interocular distance; ocellular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella forming almost an even arch from one orbit to other, minimally concave on each side (Fig. 1031). Dorsal length of flagellomere I  $2.7 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimarginal carina with small incision shortly beyond midlength. Tergum VI with median carina length about  $1.5 \times$  midocellar diameter. Length 9.7 mm; head width 2.7 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1032).—Known from one locality in central eastern New South Wales.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: New South Wales: Burrendong Botanic Garden at  $32^{\circ}42.1'S$   $149^{\circ}06.2'E$ , 13 Dec 2009, V. Ahrens and W.J. Pulawski (AMS).

***Pison spilopteryx* Pulawski, species nova**

Figures 1033-1042.

**NAME DERIVATION.**—*Spilopteryx* is derived from two Greek words: *σπίλος*, a spot, fleck, speck, and *πτέρυξ*, a wing; a noun in apposition to the generic name.

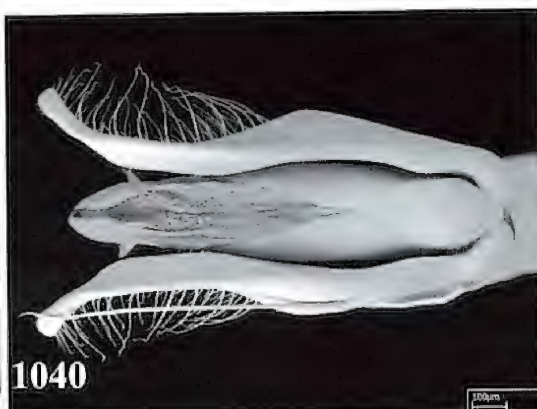
**RECOGNITION.**—*Pison spilopteryx* has abundant erect setae on tergum I, mesopleural punctures less than one diameter apart, and only a few, scattered punctures on sternum III and IV. In addition, its mandible is simple (posterior margin not step-like, inner margin not tridentate in female and not bidentate in male), and the female gena is punctate and setose on each side of the oral fossa. Several species (*Pison fenestratum*, *P. festivum*, *P. pauper*, and *P. rarum*) are similar, but *P. spilopteryx* differs in having the pronotal collar (at least laterally) and the apical depression of tergum I with bright golden setae (as well as the setae on the apical depressions of the remaining terga), and at least the inner side of the hindtibia and the tarsi are ferruginous. Also, in most specimens the apex of the medial cell, the first submarginal cell (all or anteriorly), and the marginal cells are markedly infumate, well contrasting with the remaining wing membrane. The ocellular distance of the female equal to  $1.4 \times$  hindocellar diameter is a subsidiary recognition feature. In the other species, the setae of the pronotal collar and of tergum I are silvery, the legs all black, and the forewings are not infumate.

**DESCRIPTION.**—Frons aciculate and slightly shiny between punctures, punctures fine in lower half, large between midocellus and orbit, less than one diameter apart (Fig. 1035), with a few exceptions. Labrum not emarginate. Anteromedian pronotal pit oval, slightly shorter than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin, but with compressed, elongate punctures there; scutal punctures conspicuous, mostly less than one diameter apart (several punctures behind center more than one diameter apart); interspaces unsculptured. Mesopleural punctures well defined, less than one diameter apart; interspaces





FIGURES 1033-1038. *Pison spilopteryx* Pulawski, sp. nov. (1033) Female clypeus and mandibles; (1034) Male clypeus and mandibles; (1035) Upper frons of female; (1036) Female head in dorsal view; (1037) Female left wings; (1038) Female gaster in dorsal view.



FIGURES 1039-1041. *Pison spilopteryx* Pulawski, sp. nov., male. (1039) Sternum VIII (ventral surface); (1040) Genitalia in dorsal view; (1041) Genitalia in lateral view.

unsculptured. Postspiracular carina absent or present, about as long as midocellar diameter. Metapleural sulcus not costulate or costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum conspicuously punctate (some punctures more than one diameter apart), interspaces either not merging or merging into

ridges; side conspicuously punctate, punctures in some specimens more than one diameter apart anteriorly, interspaces not merging into ridges; posterior surface conspicuously ridged, punctate between ridges. Second recurrent vein ending on submarginal cell III. Posteroventral forefemoral surface with well-defined punctures that are two to several diameters apart. Punctures of tergum I well defined on anterior declivity and just behind, mostly more than one diameter apart, fine and less than one diameter apart on horizontal portion; apical depression mostly deep, well below adjacent anterior part of tergum. Sternum II with conspicuous punctures that are several diameters apart (except anteriorly and laterally), impunctate apicomeresally; sterna III and IV with a few, sparse punctures.

Setae erect on thorax, forecoxal venter, femoral venters, and entire tergum I (in addition to subappressed to suberect setae on clypeus, frons, pronotum, and apical depression of tergum I); erect setae black on upper frons and tergum I; length of erect setae (expressed as fraction of midocellar diameter):  $1.0-1.5 \times$  on scutum, up to  $1.0 \times$  on hindfemoral venter, up to  $2.0 \times$  on tergum I; setae of lower gena sinuous, up to  $2.5 \times$  midocellar diameters near genal midheight; on frons suberect setae oriented ventrad along midfrontal carina, with dense group of setae ventrally of midocellus, oriented radially adjacent to midocellus; not concealing integument on clypeus. Pronotal collar (only laterally in specimen from Victoria) and apical depression of tergum I with bright golden, subappressed setae, tergum II either with black setae only in most specimens, but golden setae present posterolaterally in specimen from Victoria, and conspicuous on apical depression in specimen from Crediton State Forest; tergum III and following ones fully covered with bright golden setae (Fig. 1038).

Head, thorax, propodeum, and gaster black, apical depressions of terga brown. Apex of medi-



al cell as well as first submarginal cell (all or anteriorly) and marginal cells markedly infumate in most specimens, contrasting with remaining wing membrane (Fig. 1037), but not infumate in specimen from Crediton State Forest. Femora black in most specimens, but all ferruginous in specimens from Pendland, and largely so in specimen from Crediton State Forest; tibiae and tarsi ferruginous in specimen from Victoria, that from Crediton State Forest, and those from Pendland; in remaining specimens tibiae largely black, partly ferruginous (inner surface of hindtibia all ferruginous); tarsi ferruginous, apical tarsomeres dark in most specimens.

♀.—Upper interocular distance equal to  $0.80\text{--}0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.2 \times$  hindocellar diameter (Fig. 1036); eye height equal to  $0.90\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 1033). Dorsal length of flagellomere I  $2.8\text{--}2.9 \times$  apical width, of flagellomere IX  $1.7\text{--}1.8 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 10.0–12.2 mm; head width 2.9–3.3 mm.

♂.—Upper interocular distance equal to  $0.82 \times$  lower interocular distance; ocellocular distance equal to  $1.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Free margin of clypeal lamella angulate, nearly rectangular (Fig. 1034). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere X  $1.5 \times$  apical width. Sternum VIII broadly emarginate, apicolateral arm acutely angulate (Fig. 1039). Genitalia: Figs. 1040–1041. Length 10.1 mm; head width 3.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1042).—

New South Wales, South Australia, Queensland, Victoria.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA:** **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , 29 Dec 2011, V. Ahrens and W.J. Pulawski (AMS).

**PARATYPES:** **AUSTRALIA:** **New South Wales:** Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$ , V. Ahrens and W.J. Pulawski, 27 Dec 2011 (1 ♀, CAS), 28 Dec 2011 (2 ♀, CAS), 29 Dec 2011 (2 ♀, CAS); Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$ , 17 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♀, CAS); near Warrumbungle National Park at  $31^{\circ}16.9'S$   $149^{\circ}04.8'E$ , 1 Jan 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Queensland:** Crediton State Forest at  $21^{\circ}11.8'S$   $148^{\circ}29.7'E$ , 2 Nov 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$ , 28 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Pendland at  $20^{\circ}31.0'S$   $145^{\circ}24.2'E$ , 18 and 19 Nov 2012, V. Ahrens and W.J. Pulawski (2 ♀, CAS). **South Australia:** 3 km ENE Wilpena in Flinders Ranges National Park at  $31^{\circ}31.0'S$   $138^{\circ}36.6'E$ , 22 Dec 2010, V. Ahrens and W.J. Pulawski, 22 Dec 2010 (4 ♀, 1 ♂, CAS), 23 Dec 2010 (2 ♀, CAS), and 27 Dec 2010 (1 ♀, CAS). **Victoria:** no specific locality, date, or collector's name (1 ♀, BMNH).



FIGURE 1042. Collecting localities of *Pison spilopteryx* Pulawski, sp. nov.

***Pison spinolae* Shuckard**

Figures 1043–1055.

*Pison spinolae* Shuckard, 1838:76, ♀ (as *Spinolae*, incorrect original capitalization). Syntypes ("in my own collection and that of Rev. F.W. Hope"): ♀, Australia: New South Wales: Sydney (depository unknown). — F. Smith, 1856:315 (in catalog of Hymenoptera in British Museum); A. Costa, 1864:61 (one specimens from Adelaide, Australia, in Napoli Museum); de Saussure, 1867:66 (Australia: Sydney; redescription); F. Smith, 1869:290 (in checklist of *Pison*); Kohl, 1885:188 (in checklist of world *Pison*); H. Roth,

1885:321 (nest structure, prey); Froggatt, 1892:218 (in catalog of Australian Hymenoptera), 1894:33 (nest and prey); Radoszkowski, 1892:592 (male genitalia); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1915:558 (in key to *Pison* of Tasmania, geographic distribution), 1916b:597 (in key to *Pison* of Australia), 607 (diagnostic characters, locality records); Richards, 1930:91 (nest); Cumber, 1953:16 (New Zealand; nest parasite, *Melittobia clavicornis* (Cameron)); Miller, 1955:36 (nesting sites, preying on spiders); Cowley, 1961:45 (parasite: *Melittobia clavicornis*), 1962:355 (egg and larva); Sharell, 1971:179 (nesting habits); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Callan, 1977:45 (parasite: *Macrosiagon diversiceps* (Blackburn), a rhipiphorid beetle); Ferro et al., 1877:16 (common name in New Zealand: mason wasp); Callan, 1979:34 (New Zealand; available information reviewed); Casolari and Casolari Moreno, 1980:114 (specimens in M. Spinola collection); Evans, Matthews, and Hook, 1981:225 (nesting behavior); Cardale, 1985:262 (in catalog of Australian Sphecidae); Macfarlane and Palma, 1988:423 (nest parasite: *Melittobia australica* Girault, a eulophid); Naumann, 1990a:24 (Norfolk Island); Valentine and Walker, 1991:40 (in catalog of New Zealand Hymenoptera); K. Walker, Naumann, Austin, Taylor, and Cardale, 1992:49 (in catalog of insects of Tasmania); Harris, 1994:33 (in Fauna of New Zealand, description of mature larva, cocoon, nest); Smithers, 1998:46 (in list of insects of Norfolk Island); Pagliano, 2003a:508 (Australia: Victoria: Melbourne), 2011:115 (specimens in coll. Spinola, Torino).

*Pison australe* de Saussure, 1854:11, ♀ (as *australis*, incorrect original termination). Holotype or syntypes: ♀, New Holland, now Australia: no specific locality (MHNG). Synonymized with *Pison spinolae* by F. Smith, 1956:315. – de Saussure, 1863:69 (synonymy with *P. spinolae* recorded).

*Pison tasmanicum* F. Smith, 1956:316, ♀ (as *tasmanicus*, incorrect original termination). Holotype or syntypes, ♀, Australia: Van Diemen's Land, now Tasmania: no specific locality (BMNH). Synonymized with *Pison spinolae* by F. Smith, 1869:290.

*Taranga dubia* W.F. Kirby, 1883:201, ♂. Holotype or syntypes, ♂, New Zealand, no specific locality (BMNH). Synonymized with *Pison spinolae* by Turner, 1916b:607. – As *Pison dubium*: Kohl in Dalla Torre, 1897:711 (new combination, in catalog of world Hymenoptera).

*Pison pruinsum* Cameron, 1898:44, ♀ (as *pruinus*, incorrect original termination). Holotype or syntypes, ♀, New Zealand: Greymouth (BMNH). Synonymized with *Pison spinolae* by Turner, 1916b:607. – Cameron, 1901:220 (known from New Zealand).

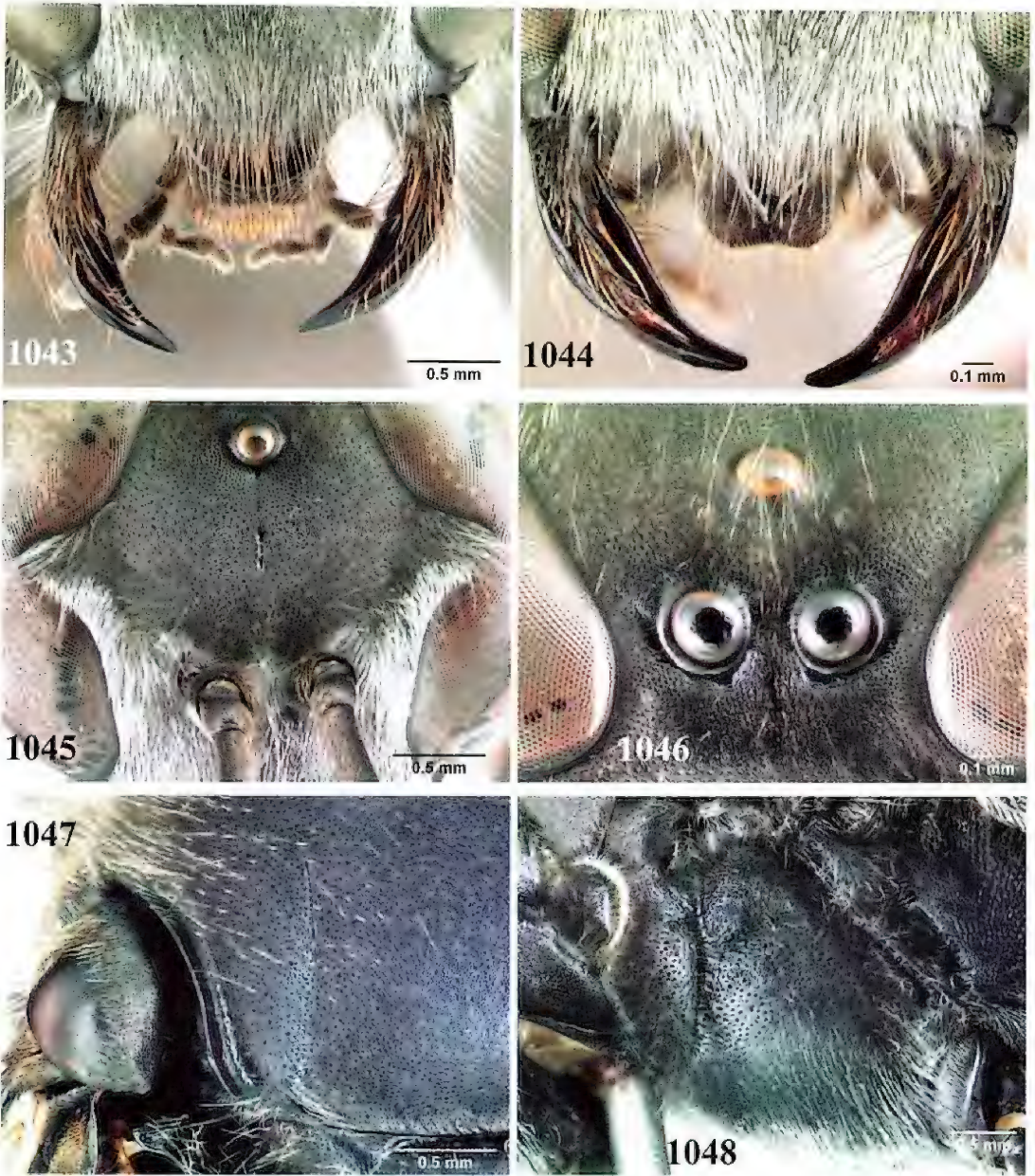
**UNCERTAIN TYPE STATUS.**— A specimen in The Natural History Museum, London, has the following labels: a handwritten label "VDM" [= Van Diemen's Land, now Tasmania], a printed label "F. Smith collection, type" ("type" handwritten), a handwritten label in faded red ink "*Spinolae*", a handwritten label in brown gall ink "*Spinolae*", and a printed label "BMNH Type 21.561" ("21.561" handwritten). Although regarded as a type by Baker (1998), this specimen may not be a syntype, as it comes from Tasmania rather than Sydney, Australia. On the other hand, the locality label Sydney in the original description may be inaccurate and the specimen may have passed from Shuckard to Frederic Smith, hence the note "type" on one of the labels. The red ink label with the species name looks very old and it seems to point to Shuckard's era. The status of the specimen is clearly uncertain.

No original material of *Pison spinolae* could be found in the Oxford Museum (e-mail from James Hogan, responsible for Hymenoptera, on 15 July 2011).

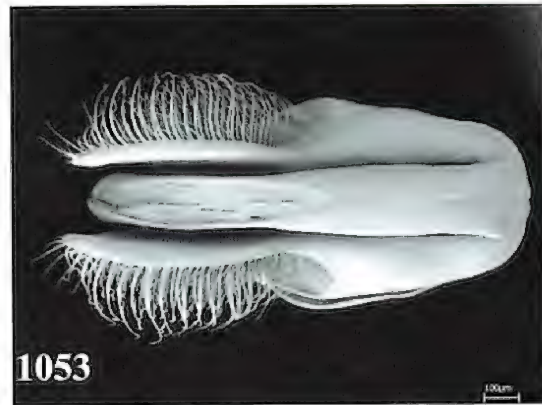
In spite of this uncertainty, I treat as *P. spinolae* all the specimens conspecific with the London specimen, thus following the traditional interpretation of this species (e.g., Turner, 1916b).

**RECOGNITION.**— *Pison spinolae* is one of the largest Australian members of the genus, its length being 8.8–16.0 mm in the female, and 6.5–13.0 mm in the male. It is all black, with erect setae on the head, thorax, propodeum, femora, tergum I, and sternum II. It can be recognized by its mesothoracic sculpture: the scutum is dull, conspicuously microareolate, with two sizes of ill-defined punctures: small and minute, whereas the mesopleuron has well-defined punctures that are more than one diameter apart at the center. Subsidiary recognition punctures are: sternum II





FIGURES 1043-1048. *Pison spinolae* Shuckard. (1043) Female clypeus and mandibles; (1044) Male clypeus and mandibles; (1045) Female frons; (1046) Female vertex; (1047) Female tegula and adjacent scutum (1048) Female mesopleuron.



FIGURES 1049-1054. *Pison spinolae* Shuckard. (1049) Female tergum I in lateral view; (1050) Male flagellum; (1051) Male flagellomeres I-III; male: (1052) Sternum VIII (ventral surface); (1053) Genitalia in dorsal view; (1054) Genitalia in lateral view.



impunctate apicomesally, ocellocular distance smaller than hindocellar diameter, propodeal dorsum ridged, dull, and absence of longitudinal carina between propodeal dorsum and side. *Pison lucens* and *P. priscum* are somewhat similar, but differ, among others, in having the propodeal dorsum and posterior surface punctate, without ridges, the punctures averaging several diameters apart (in *P. spinolae*, the propodeal dorsum and posterior surface are ridged, punctate between ridges). *Pison spinolae* also resembles *P. oceanicum*, an endemic of Christmas Island. See that species for differences.

**DESCRIPTION.**—Frons dull, shallowly microscopically punctate (punctures contiguous) and with larger punctures averaging several diameters apart at center (Fig. 1045). Labrum truncate apically. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, not ridged adjacent to posterior margin, dull, conspicuously microareolate, with ill defined punctures of two sizes that average several diameters apart: small and minute. Tegula enlarged. Mesopleuron microsculptured, with conspicuous punctures that average about two diameters apart at center (Fig. 1048). Postspiracular carina varying from well defined (and about as long as hindocellar diameter) to absent. Metapleural sulcus well defined, costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior face and extending from gastral socket area toward spiracle; dorsum obliquely ridged, punctate between ridges; side punctate; posterior surface ridged. Forewing mostly with three submarginal cells, but with two cells in about 1% of females and up to 20% of males in some areas of New Zealand (Harris, 1994); with three cells on one wing and two on the other in some specimens. Punctures of posteroventral forefemoral surface several diameters apart in female, 2-3 to several diameters apart in male. Tergum I with fine punctures that average 1-2 diameters apart, and with larger punctures that are several to many diameters apart. Sternum II impunctate apicomesally.

Setae erect on frons, thorax, propodeum, forecoxal venter, femoral venters, tergum I (Fig. 1049), and sternum II (except for apical depression); longest setae (on gena) slightly longer than three midocellar diameters; setae silvery from several angles, brown from others; apical depressions of terga I-III with silvery, setal fasciae.

Head, thorax, propodeum, gaster, and legs black. Wings slightly to markedly infumate; humeral plate dark brown, almost black.

♀.—Upper interocular distance equal to  $0.5-0.6 \times$  lower interocular distance; ocellocular distance equal to  $0.6-0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5-0.7 \times$  hindocellar diameter (Fig. 1046); eye height equal to  $0.98-1.0 \times$  distance between eye notches. Dorsal length of flagellomere I  $3.4-3.5 \times$  apical width, of flagellomere IX  $2.0-2.2 \times$  apical width. Clypeal lamella roundly prominent (Fig. 1043). Mandible: trimmal carina with small notch shortly beyond midlength; acetabular groove with two rows of punctures. Length 8.8-16.0 mm, head width 2.8-3.6 mm.

♂.—Upper interocular distance equal to  $0.7 \times$  lower interocular distance; ocellocular distance equal to  $0.7-0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.1 \times$  hindocellar diameter; eye height equal to  $1.04-1.12 \times$  distance between eye notches. Free margin of clypeal lamella sharply pointed (Fig. 1044). Flagellomeres II-IV with tyloids (Fig. 1051), III-V slightly convex ventrally except slightly concave basally (Fig. 1050). Dorsal length of flagellomere I  $2.8-3.2 \times$  apical width, of flagellomere X  $1.5 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 1052). Genitalia: Figs. 1053, 1054. Length 6.5-13.0 mm, head width 2.7-3.6 mm.

**NESTING HABITS.**—Roth (1885) was the first to describe a nest of *Pison spinolae*, but his identification of the species is not certain. The nest is an elongate, fragile structure consisting of thin

walls and containing one row of about six cells separated by thin partitions (Froggatt, 1894); its outer surface is granulate from the balls of mud not being smoothed down as each is added to the structure. The nests are built "in any hole or cranny", frequently "in a keyhole or empty rung hole in a chair". Richards (1930) described hexagonal mud cells found on a piece of wood near Newport, vicinity of Sydney, from which a single female of *P. spinolae*, one female and two males of *P. virosum*, and an empty puparium of a bombyliid fly were extracted. Females construct mud nests in New Zealand in sheltered, undisturbed sites, particularly in houses (Valentine and Walker, 1991), on tree trunks, rocks, banks, and man-made objects such as keyholes (Sharell, 1971; Harris, 1994), on Norfolk Island (Naumann, 1990a) in protected situations (especially in holes and crevices in wood), and are commonly seen around buildings.

The species has two generation per year in New Zealand according to Cowley (1962) who described the preimaginal stages of *P. spinolae*. The linear nests have up to six cells. High humidity is required for the egg to hatch, apparently maintained by evaporation from the freshly finished clay partitions. The following eight species of spider prey were found in the nests: *Arachnura feredayi* (L. Koch), *Araneus crassus* Walckenaer, *Argiope protensa* L. Koch, *Colaranea* (as *Aranea*) *viriditas* (Urquhart), *Cyclosa trilobata* (Urquhart), *Cyclosa* sp., *Novaranea* (as *Aranea*) *laevigata* (Urquhart), all Araneidae, and *Leucauge dromedaria* (Thorell), a tetragnathid. Evans, Matthews, and Hook (1981) described nests containing 4-6 cells (cell length 13-26 mm) separated by thin mud partitions, and closed off with plugs 2-4 mm thick. The number of spiders varied from five to 12 per cell (four to 16 prey per cell according to Harris, 1994), and the egg was placed dorsolaterally near the front of the opistosoma on the spider closest to the cell entrance. The following prey were found, *Araneus brisbanae* (L. Koch) and *Eriophora* (as *Araneus*) *transmarina* (Keyserling), both Araneidae, and *Phonognatha* sp. (as *Singotypa*, Tetragnathidae). Araneidae and Tetragnathidae are closely related and placed in a single superfamily Araneioidea.

The nest parasites in New Zealand are the eulophids *Melittobia hawaiiensis* Perkins (as *clavicornis* (Cameron)) according to Cumber (1953) and Cowley (1961), the adventive *Melittobia australica* Girault according to Macfarlane and Palma (1988), and in Australia the rhipiphorid beetle *Macrosiagon diversiceps* (Blackburn) according to Callan (1977).

**GEOGRAPHIC DISTRIBUTION (Fig. 1055).—**

Australia north to Eungella National Park in central Queensland, Norfolk Island, introduced to New Zealand around 1880 (Callan, 1979); first recorded from there by Kirby, 1883, under the name of *Taranga dubia*. There is one record from New Guinea.



FIGURE 1055. Collecting localities of *Pison spinolae* Shuckard.

**RECORDS.— AUSTRALIA:** Australian Capital Territory: Australian National University (1 ♀, ANIC), Canberra (27 ♀, 29 ♂, ANIC), Canberra: Black Mountain (6 ♀, 3 ♂, ANIC; 9 ♀, 3 ♂, BMNH, 2 ♀, UCD), Cook (1 ♀, ANIC), Flynn (1 ♀, ANIC), Paddy River near Canberra (3 ♂, BMNH). **New South Wales:** Armidale (6 ♀, 1 ♂, ANIC), Bellbrook (1 ♀, AMS), 6 km NE Bilpin (1 ♀, AMS), Clydemount (1 ♂, CAS), Congo 8 km SE Moruya at 35°58'S 150°09'E (3 ♀, SAM), Dorrigo National Park (1 ♀, ANIC), Doyles River State Forest 50 km NW Taree at 31°31'S 152°14'E (8 ♀, AMS), near Ebor (1 ♂, BMNH), 5 km W Ebor at 30°26.5'S 152°18.9'E (2 ♀, CAS), Epping (1 ♀, AMS), upper Genoa River (1 ♀, ANIC), Harrington (1 ♀, AMS), Haystack Ridge near Mount Tomah (1 ♀, AMS), Heathcote (1 ♀, AMS), Kioloa (1 ♀, ANIC), Kurnell (1 ♂, AMS), Kurrajong (1 ♀, AMS), Lake George Cullerin (1 ♂, UCD), 3 km



N Lansdowne near Taree (1 ♀, AMS), Lord Howe Island at 31°31'37"S 159°03'58"E (1 ♀, ANIC; 1 ♀, 1 ♂, AMS; 1 ♀, SAM) and at 31°32'S 159°04.5'E (1 ♂, ANIC), Manly (3 ♀, 3 ♂, ANIC), Mount Kaputar National Park at Dawson's Spring (1 ♀, CAS) and at 30°16.2'S 150°06.1'E, 900 m (1 ♀, CAS), Mount Tomah (5 ♀, 7 ♂, AMS), near Mount Tomah (3 ♀, AMS), Mount Wilson (1 ♀, CAS), Nadgee Nature Reserve 10 km S Newton's Beach (76 ♀, 318 ♂, ANIC; 2 ♀, 1 ♂, CAS, 2 ♀, UCD), Newport near Sydney (Richards, 1930), Springwood (1 ♀, AMS), 4 km W Sunny Corner at 33°22.7'S 149°51.6'E (17 ♀, 5 ♂, CAS), Sydney (3 ♀, AMS; 2 ♀, BMNH), Sydney: North Harbour (2 ♀, AMS), Sydney University (1 ♀, 1 ♂, ANIC), Taralga (Turner, 1916b), Temagog (1 ♀, 1 ♂, AMS), Ulong (2 ♀, AMS), Whiskers 7 km WNW Hoskinstown at 35°24'S 149°23'E (14 ♀, 7 ♂, ANIC), Wilton (3 ♀, ANIC), Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E (1 ♀, CAS), Wollongong: Mount Pleasant (1 ♀, 1 ♂, AMS), Woodford (1 ♀, BMNH). **Norfolk Island** (from Naumann, 1990a or as indicated): Ball Bay, Burnt Pine (1 ♀, RMNH), Cascade, Highlands Guesthouse, Kingston (1 ♀, ANIC, 1 ♀, RMNH), Mount Bates (2 ♀, RMNH), Mount Pitt Reserve (6 ♀, RMNH), Rocky Point Reserve (1 ♂, ANIC), Selwyn Pine Road, mouth of Stockyard Creek, no specific locality (2 ♀, ANIC; 1 ♀, BMNH). **Queensland**: Brisbane (5 ♀, 1 ♂, QMB), Brisbane: Bardon (1 ♀, BMNH), Brookfield (2 ♀, QMB), Coopers Plains (1 ♂, QMB), Crediton State Forest at 21°11.9'S 148°29.9'E (1 ♀, CAS), Eungella National Park at 21°10.5'S 148°30.3'E (3 ♀, CAS), Lamington National Park at 28.207°S 153.137°E (1 ♀, QMB; 1 ♀, RMNH), Montville (3 ♀, QMB), Mount Glorious at 27°20'S 152°45'E (1 ♂, BMNH; 1 ♀, QMB), Mount Tambourine (1 ♀, BMNH), Stanthorpe (1 ♂, BMNH), Toowoomba (Turner, 1915, 1916), Yarraman (1 ♂, QMB), Warwick (1 ♀, QMB). **South Australia**: Adelaide (2 ♀, BMNH; 1 ♂, SAM), Adelaide: Stonyfell (1 ♀, SAM), Balhannah (1 ♀, SAM), Lake Eyre (1 ♀, SAM), Mount Lofty (Turner, 1916b), Oakbank (3 ♀, SAM), Stirling (1 ♂, SAM), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (1 ♂, CAS). **Tasmania**: Battery Point (1 ♀, ANIC), Celery Top islands near Bathurst Harbour at 43°22'S 146°09'E (1 ♀, ANIC), Eaglehawk Neck (Turner, 1915), Franklin River at 42°13'S 146°01'E (9 ♀, 1 ♂, ANIC), 1 km SSE Gladstone at 40°58'S 148°01'E (3 ♀, ANIC), Great Pine Tier (1 ♀, BMNH), Greens Beach (1 ♀, ANIC), Hobart (1 ♀, QMB; 1 ♀, 1 ♂, SAM; 1 ♀, UCD), Launceston: Newstead (2 ♀, 1 ♂, ANIC), Lefroy (1 ♀, SAM), Montumana (1 ♂, ANIC), Mount Barrow 11 km NE Nunamara at 41°23'S 147°25'E (3 ♂, ANIC), Mount Field National Park (1 ♀, BMNH), Mount Wellington (Turner, 1916b), Nelson Creek 7 km WSW Buckland (1 ♀, UCD), 4 km W Orford at 42°34'S 147°50'E (1 ♂, ANIC), Pelion Hut 3 km S Mount Oakleigh at 41°50'S 146°03'E (1 ♀, ANIC), Poatina at 41°49'S 146°54'E (2 ♀, ANIC), Pyengana (1 ♀, SAM), St. Helens (1 ♂, SAM), Tyenna (1 ♀, SAM), Ulverstone (3 ♀, BMNH). **Victoria**: Clayton (1 ♀, ANIC), Eltham 20 km NE Melbourne center (3 ♀, AMS), Frankston (1 ♀, CAS), Heidelberg (2 ♂, CAS), Melbourne (1 ♀, 1 ♂, BMNH), Mooroolbark (1 ♀, SAM, as Mooroolbrook), Mount Waverley (1 ♂, SAM), Toolangi (1 ♀, BMNH). **Western Australia**: Busselton (1 ♀, WAM), West River (1 ♀, BMNH).

**INDONESIA: West Papua** (= Indonesian New Guinea): Jayapura (1 ♀, RMNH, as Hollandia).

**NEW ZEALAND: North Island**: Auckland Region: Onewhero (1 ♀, RMNH); Hawkes Bay Region: Haumoana (3 ♀, 1 ♂, CAS), Lake Waikaremoana (2 ♀, RMNH), Puketitiri (2 ♀, CAS); Masterton Region: 18 km NNW Masterton at 40.807°S 175.559°E (16 ♀, 5 ♂, RMNH), Taupo (1 ♂, CAS); Waiheke Island: Rocky Bay (4 ♀, RMNH); Wellington Region: Island Bay (Macfarlane and Palma, 1988), Wellington (Turner, 1916b). **South Island**: Canterbury Region: near Kekerengu at 42°00' 174°01'E (3 ♀, RMNH); Marlborough Region: Crail Bay (1 ♀, RMNH); Otago Region: Young River 20 km above Lake Wanaka (1 ♂, CAS); Southland Region: Te Anau (1 ♀, CAS); Tasman Region: Wakefield (1 ♀, OXUM); West Coast Region: Grey-mouth (Cameron, 1898), 2 km S Haast at 43°53'S 169°03'E (1 ♀, RMNH), banks of Lake Ianthe N Harihari which is 43°09'S 170°32'E (1 ♀, RMNH).

### *Pison stenometopon* Pulawski, species nova

Figures 1056-1062.

**NAME DERIVATION.**—*Stenometopon* derives from two Greek words: στενός, *narrow*, and μέτωπον, *forehead, front*; with reference to the unusually narrow upper interocular distance of this species female.

**RECOGNITION.**—*Pison stenometopon* is an all black species, with three submarginal cells, the

second recurrent vein ending at the very apex of the second submarginal cell, the setae appressed on tergum I, the tegula finely punctate throughout, and a carina separating the propodeal side from the dorsum and the posterior surface. The female is characterized by the presence of a psammophore on the lower gena and the gena unsculptured and asetose between the hypostomal carina and the psammophore. It differs from similar species by the following combination: body all black, tegula finely punctate throughout, genal psammophore short (setal length equal to midocellar diameter), and forefemur without a psammophore (its longest setae shorter than midocellar diameter). In addition, the clypeal lamella is widely arcuate and forms an obtuse angle on each side, the distance between the angles being equal to the distance between an angle and the adjacent orbit.

The male can be recognized by its all black body, the tegula finely punctate throughout, and sternum VIII rounded apically. The cylindrical flagellum and the presence of short erect setae on sterna V-VII (setal length up to  $0.7 \times$  midocellar diameter) are subsidiary recognition features.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Distance between antennal socket and orbit about equal to socket width. Gena narrow in dorsal view (Fig. 1057). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron largely impunctate, minutely microsculptured. Scutum finely foveate along flange, with or without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart; interspaces finely microsculptured (Fig. 1058). Scutellum foveate along anterior margin. Tegula slightly enlarged, finely punctate throughout. Mesopleural punctures fine, less than one diameter apart. Postspiracular carina present, slightly shorter than midocellar diameter. Metapleural sulcus somewhat costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged, ridges evanescent toward lateral and posterior margins; side ridged (ridges well defined dorsally, evanescent ventrally), punctate between ridges; posterior surface irregularly ridged, with several conspicuous ridges radiating up from transverse carina just above gastropodeal articulation. Forewing with three submarginal cells; second recurrent vein ending at very apex of submarginal cell II. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of horizontal part of tergum I, anterior to apical depression, with minute punctures about one diameter apart. Sterna minutely punctate throughout.

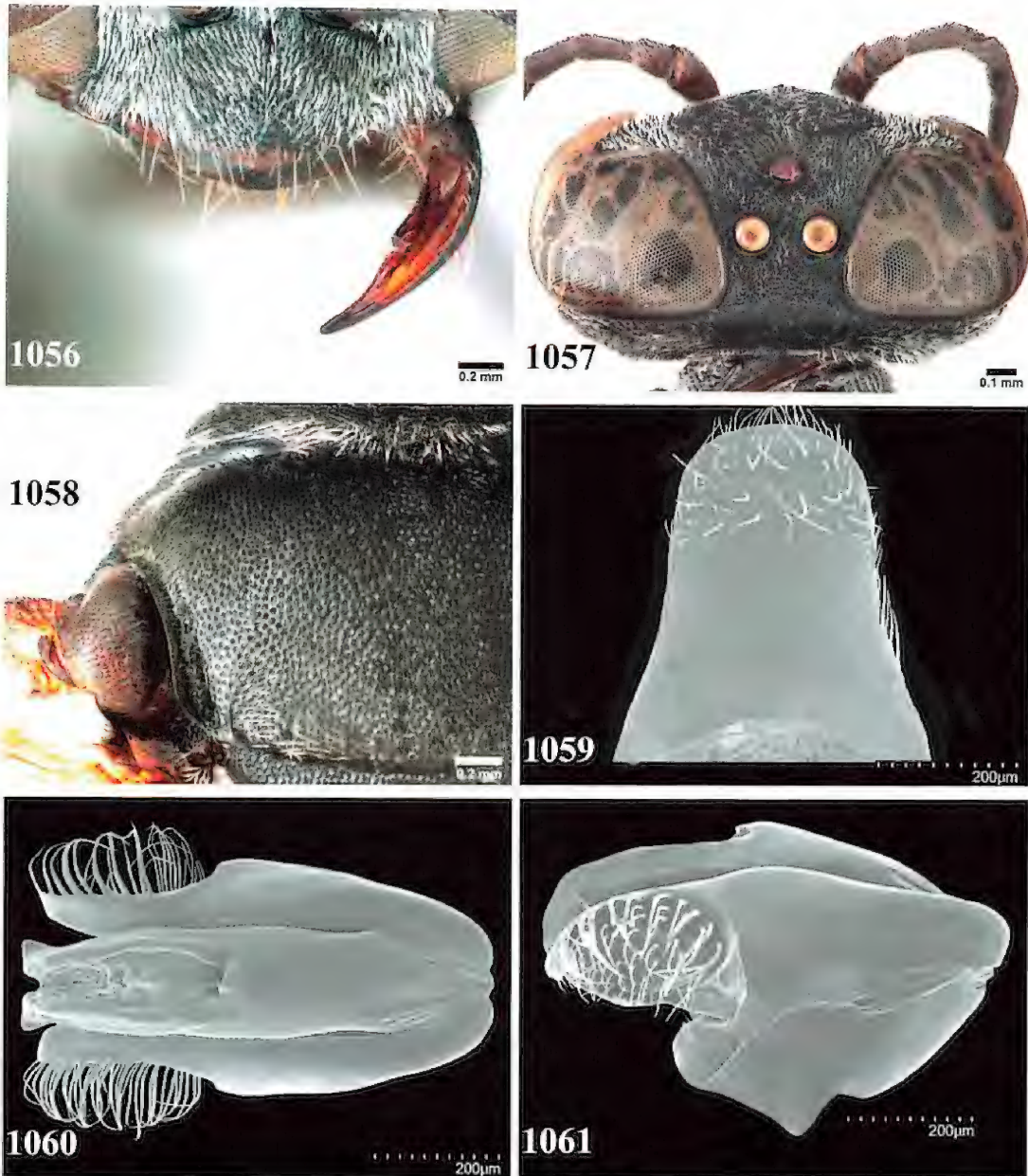
Setae silvery, appressed on frons, postocellar area, scutum, and tergum I, fully appressed on mesopleuron, not concealing integument on clypeus (see below for genal setae). Apical depressions of terga with inconspicuous silvery setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.46-0.58 \times$  lower interocular distance; ocellocular distance equal to  $0.2-0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8-1.0 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella broadly arcuate, forming obtuse angle at each side (Fig. 1056); distance between angles equal to distance between angle and adjacent orbit. Dorsal length of flagellomere I  $2.0-2.3 \times$  apical width, of flagellomere IX  $1.1-1.2 \times$  apical width. Lower gena with straight, erect setae forming short psammophore (setae of psammophore as long as midocellar diameter), shiny, unsculptured, asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision shortly beyond midlength. Forefemoral venter without psammophore, its longest setae less than one midocellar diameter long. Length 5.1-7.0 mm; head width 1.7-2.4 mm.

♂.—Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4-1.5 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamel-





FIGURES 1056-1061. *Pison stenometopon* Pulawski, sp. nov., female. (1056) Clypeus and mandible; (1057) Head in dorsal view; (1058) Tegula and adjacent scutum; male: (1059) Sternum VIII (ventral surface); (1060) Genitalia in dorsal view; (1061) Genitalia in lateral view.

la acutely angulate. Dorsal length of flagellomere I  $1.7\text{--}2.1 \times$  apical width, of flagellomere X  $1.0 \times$  apical width. Sterna V-VII with short erect setae (setal length up to  $0.7 \times$  midocellar diameter); sternum VIII rounded apically (Fig. 1059). Genitalia: Figs. 1060, 1061. Length 6.0-6.5 mm; head width 1.9-2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1062).— Northern Territory, South Australia, Western Australia.

**RECORDS.**— HOLOTYPE: ♀ **AUSTRALIA: Northern Territory:** Ngarradj Warde, Djobkeng in Kakadu National Park, 27 June 1980, I.D. Naumann (ANIC).

**PARATYPES:** **AUSTRALIA: South Australia:** Calperum Station 14 km WNW Renmark at  $34^{\circ}07'S$   $140^{\circ}37'E$ , 7 Nov – 13 Dec 1995, K.R. Pullen (1 ♀, CAS). **Western Australia:** Fitzgerald River National Park at  $33.949416^{\circ}S$   $119.926086^{\circ}E$ , 17 Jan 2010, S. Krause (2 ♀, CAS; 1 ♀, MNKB) and L. Breitkreutz and S. Krause, 16-18 Jan 2010 (1 ♂, MNKB) and 18-22 Jan 2010 (1 ♂, CAS); Yalgorup National Park at  $32.880160^{\circ}S$   $115.682545^{\circ}E$ , 27 Jan 2010, S. Krause (1 ♀, MNKB).



FIGURE 1062. Collecting localities of *Pison stenometopon* Pulawski, sp. nov.

***Pison subtile* Pulawski, species nova**

Figures 1063-1070.

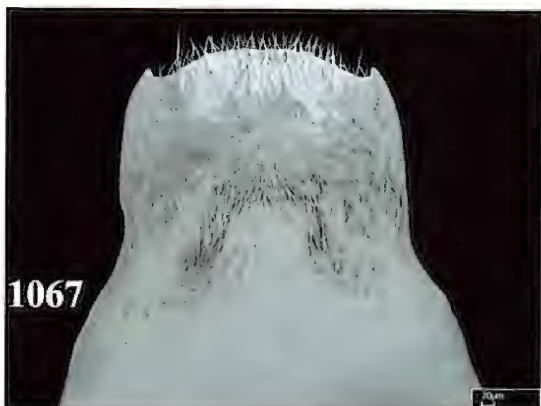
**NAME DERIVATION.**— *Subtile*, Latin neuter adjective meaning *fine, subtle, delicate*; with reference to the finely sculptured frons and scutum.

**RECOGNITION.**— The male of *P. subtile* (the female is unknown) has three submarginal cells, the second recurrent vein ending on the third submarginal cell, and the setae appressed on tergum I. The apical margin of sternum VIII is slightly convex, not emarginate (Fig. 1067) and, unlike the other species with this character, the mesopleural punctures are more than one diameter apart (rather than linear or compressed against each other), the scutal punctures are minuscule and ill defined (Fig. 1065) rather than larger and well defined, all setae of the frons are oriented dorsally (rather than oriented ventrally in the ventral half of the frons), flagellomeres III and IV are concave basoventrally and expanded apicoventrally (Fig. 1066) rather than cylindrical or insignificantly concave basoventrally), and the tibiae are ferruginous rather than black. The obtusely angu-



FIGURES 1063-1064. *Pison subtile* Pulawski, sp. nov., male. (1063) Clypeus; (1064) Upper frons.





FIGURES 1065-1069. *Pison subtile* Pulawski, sp. nov., male. (1065) Tegula and adjacent scutum; (1066) Flagellomeres II-IV; (1067) Sternum VIII (ventral surface); (1068) Genitalia in dorsal view; (1069) Genitalia in lateral view.

late free margin of the clypeal lamella (Fig. 1063) is a subsidiary recognition feature.

**DESCRIPTION.**— Frons slightly swollen above antennal sockets, dull, punctures shallow, minute, nearly contiguous; middle supraantennal carina replaced by minute sulcus. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart; interspaces microsculptured, dull (Fig. 1065). Tegula enlarged. Mesopleural punctures well defined, about 2-3 widths apart (except about one diameter apart next to posterior margin); interspaces conspicuously microsculptured, dull. Postspiracular carina present, as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, irregularly, obliquely ridged, punctate between ridges; side finely ridged, punctate between ridges; posterior surface irregularly, transversely

ridged. Second recurrent vein ending on submarginal cell III. Punctures of tergum I fine, less than one diameter apart on horizontal part. Sternum II punctate throughout.

Setae silvery, both appressed and erect on frons (appressed setae all oriented dorsally), on scutum sparse, erect, slightly longer than midocellar diameter; on lower gena sinuous, up to two midocellar diameters long; appressed on tergum I; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black; mandible largely ferruginous mesally. Femora black, tibiae and tarsi ferruginous.

♀.—Unknown.

♂.—Upper interocular distance equal to  $0.56\text{--}0.62 \times$  lower interocular distance; ocellular distance equal to  $1.1\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9\text{--}1.1 \times$  hindocellar diameter; eye height equal to  $1.08\text{--}1.14 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 1063). Venter of flagellomeres III and IV concave basally, convex apically (Fig. 1066). Dorsal length of flagellomere I  $2.3\text{--}2.5 \times$  apical width, of flagellomere X  $1.3 \times$  apical width. Apical margin of sternum VIII slightly convex, not emarginate except concave laterally (Fig. 1067). Genitalia: Figs. 1068, 1069. Length  $8.1\text{--}8.9$  mm; head width  $1.3\text{--}1.4$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1070).—Known from two localities in New South Wales.

**RECORDS.**—HOLOTYPE: ♂, AUSTRALIA: New South Wales: Little River in Blue Mountains, 21 Nov 1982, N.W. Rodd (AMS).

PARATYPE: AUSTRALIA: New South Wales: near Bellbrook, [day not indicated] Nov 1990, N.W. Rodd (1 ♂, CAS).



FIGURE 1070. Collecting localities of *Pison subtilis* Pulawski, sp. nov.

### *Pison sulcatum* Pulawski, species nova

Figures 1071-1083.

**NAME DERIVATION.**—*Sulcatum*, Latin neuter adjective meaning *sulcate*; with reference to the sulcate male sternum VIII.

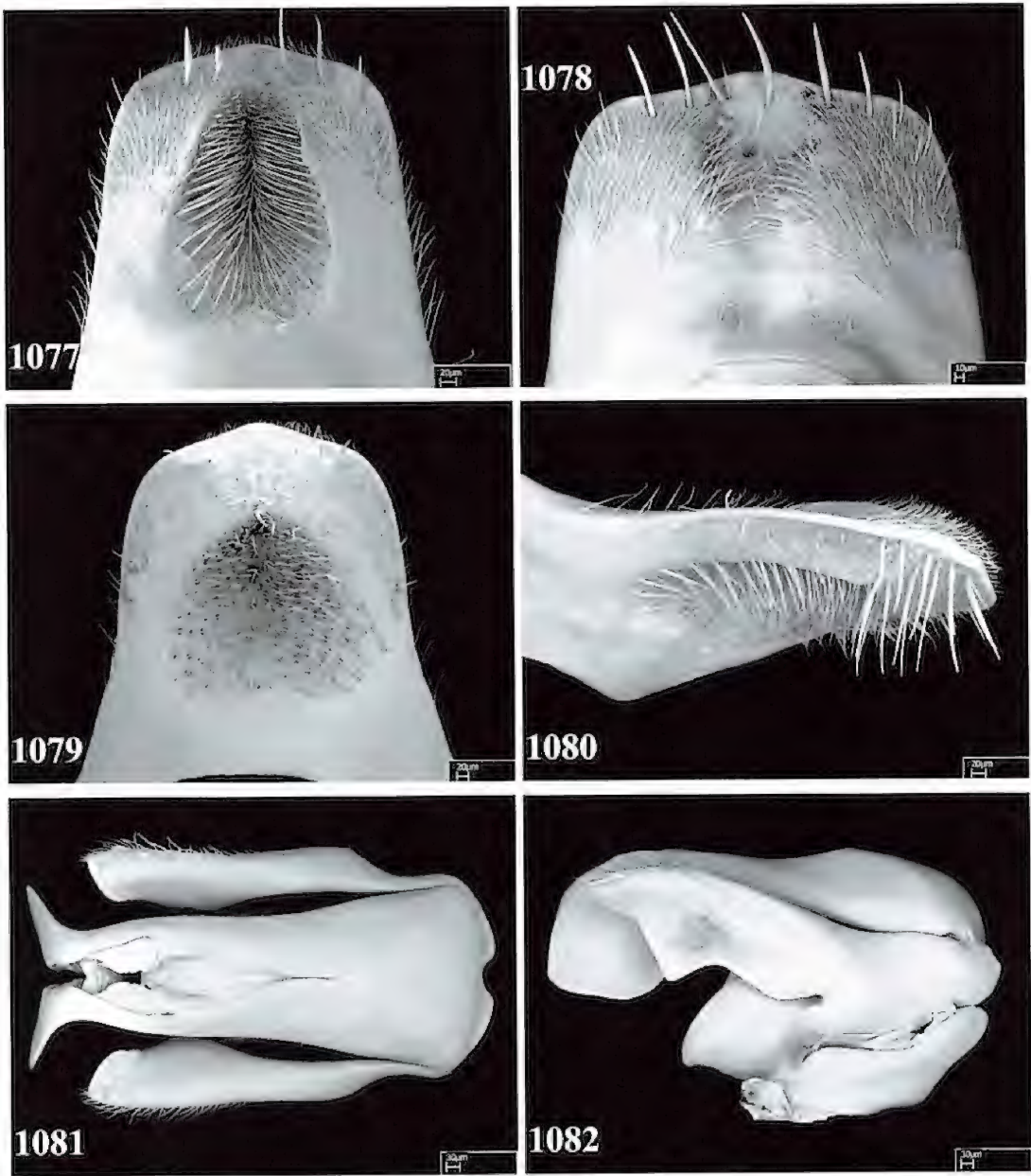
**RECOGNITION.**—*Pison sulcatum* is either all black or the tibiae and tarsi are ferruginous (apical depressions of terga brownish). It has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It is further characterized by the short setae of the lower gena (equal to about  $0.5 \times$  midocellar diameter), a patch of dorsolaterally oriented setae (ill defined in some specimens) on each side of the upper frons (between the dorsal end of the middle carina and the midocellus). An important recognition feature, shared with *P. antennatum*, *P. auriventris*, *P. compressum*, and *P. gregorii*, is a conspicuously areolate sulcus adjacent to both the anterior and posterior margin of the metanotum (i.e., on the posterior margin of the mesopleuron and on the anterior margin of the propodeal side).

The female can be recognized, in addition to the above characters, by the ocellular distance equal to  $0.4\text{--}0.9 \times$  hindocellar diameter, the dorsal length of flagellum I equal to  $2.3\text{--}2.4 \times$  its apical width, and the impunctate portion of the tegula the usual size (unlike *P. angustivertex* where the impunctate portion of the tegula is unusually small). Unlike *P. gregorii*, the clypeal lamella of *P. sulcatum* is roundly arcuate rather than acutely angulate (compare Figs. 1071 and 482), and the inner mandibular margin has no preapical tooth.





FIGURES 1071-1076. *Pison sulcatum* Pulawski, sp. nov. (1071) Female clypeus and mandibles; (1072) Male clypeus and mandibles; (1073) Female vertex; (1074) Female mesopleuron, metapleuron, and propodeal side (arrow shows metapleural sulcus); (1075) Apical hindtarsomeres of male in profile; (1076) Male sterna III and IV in lateral oblique view showing tubercles.



Figures 1077-1082. *Pison sulcatum* Pulawski, sp. nov., male. (1077) Sternum VIII (ventral surface) with stiff setae; (1078) Sternum VIII (ventral surface) with soft setae; (1079) Sternum VIII (ventral surface) with broadened median sulcus; (1080) Sternum VIII in lateral oblique view; (1081) Genitalia in dorsal view; (1082) Genitalia in lateral view.



The male can be recognized by the presence of a median concavity on the ventral surface of sternum VIII that may be either elongate or rounded; in many specimens the concavity is bordered by a swelling, at least basally, but both basally and apically in some specimens (Fig. 1080). The concavity, in many specimens, is bordered on each side by a row of stiff, dense setae (Fig. 1077), but in others the setae are soft and do not form rows (Fig. 1078). Sternum VIII rounded apicolaterally is a subsidiary recognition feature. The specimens from South Australia and most from New South Wales have a pair of sharp, admedian tubercles on sternum IV and also on sternum III in many individuals (Fig. 1076), a feature unique within the genus (the tubercles are invisible when the gastral segments are contracted). Also unique is the presence of erect setae on the venter of the three apical hindtarsomeres in specimens from South Australia (Fig. 1075), and some from New South Wales and Queensland. Both features are present in many specimens, but only the erect tarsal setae are present in some males, and both features lack in many other males. Somewhat similar is *P. tibiale* in which male sternum VIII also has a longitudinal sulcus but in contrast to *P. sulcatum* the abundant, erect setae are present on the head, thorax, propodeum, and tergum I.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures averaging less than one diameter apart. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate laterally in some specimens. Scutum not foveate or foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging less than one diameter apart; interspaces microsculptured, dull. Mesopleural punctures fine, contiguous (Fig. 1074). Postspiracular carina present, about as long as midocellar diameter. Mesopleuron adjacent to metapleuron and propodeal side adjacent to metapleuron below dorsal pit with conspicuously foveolate sulcus; mesopleural punctures less than one diameter apart. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with short transverse carinae emerging from middle carina, remaining surface obliquely ridged (ridges becoming conspicuous anteriorly and laterally, evanescent posterolaterally in many specimens); side punctate (except anteriorly), also ridged at least anterodorsally, ridges minute in specimens from Western Australia; posterior surface coarsely, transversely ridged on each side of median sulcus. Hindcoxal dorsum with outer carina effaced in anterior half. Punctures of tergum I minute, about one diameter apart. Sterna minutely, densely punctate throughout.

Setae silvery, appressed on frons, scutum, femora, and tergum I, not concealing integument on clypeus in female, concealing in male, forming patch of dorsolaterad oriented setae on each side of upper frons (between dorsal end of middle carina and midocellus, patch ill defined in some specimens); setae of lower gena suberect, straight, about  $0.5 \times$  as long as midocellar diameter. Apical depressions of terga with silvery, setal fasciae.

Body all black in most specimens, mandible ferruginous mesally (dark ferruginous in many specimens), apical tarsomeres brown, and distal flagellomeres (up to distal half of flagellum) ferruginous in many males, but hindtibia narrowly ferruginous basodorsally in one female from 3 km ENE Wilpena, South Australia, and tibiae and tarsi ferruginous (fore- and midtibiae partly black) in specimens from 45 km S Newman, Western Australia.

♀.—Upper interocular distance equal to  $0.76\text{--}0.84 \times$  lower interocular distance; ocellocular distance equal to  $0.4\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7\text{--}1.3 \times$  hindocellar diameter (Fig. 1073); eye height equal to  $0.96\text{--}1.12 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 1071). Dorsal length of flagellomere I  $2.3\text{--}2.4 \times$  apical width, of flagellomere IX  $1.3\text{--}1.6 \times$  apical width. Mandible: trimmal carina with minimal, barely perceptible incision at about midlength. Length 5.2–9.0 mm; head width 1.4–2.5 mm.

♂.— Upper interocular distance equal to  $0.82\text{--}1.0 \times$  lower interocular distance; ocellular distance equal to  $0.9\text{--}1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.96\text{--}1.0 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate in most specimens (Fig. 1072), acutely angulate in some, minimally to distinctly concave on each side of midpoint. Dorsal length of flagellomere I  $1.7\text{--}1.9 \times$  apical width, of flagellomere X  $1.1\text{--}1.3 \times$  apical width. Hindtarsomeres III–V with erect setae on venter in specimens from South Australia and some from New South Wales and Queensland (Fig. 1073). Sternum IV or sterna III and IV each with a pair of sharp tubercles medially (Fig. 1076) in most specimens from South Australia and New South Wales. The specimen from Renmark area, South Australia, has erect setae on hindtarsus but no tubercles on sterna, and many specimens (including all from Western Australia) have neither erect hindtarsal setae nor sternal tubercles. Sternum VIII with median sulcus (Fig. 1077) that in some specimens is broadened to form round concavity (Fig. 1079), in many specimens sulcus flanked by swelling, at least basally, but both laterally and apically in some individuals (Fig. 1080), in most specimens with row of dense, stiff setae oriented toward midline on each side of sulcus (Fig. 1077), in males from Western Australia setae soft and not arranged in rows (Fig. 1078); sternal apex roundly arcuate (Figs. 1077–1079). Genitalia: Figs. 1081, 1082. Length 6.2–8.5 mm; head width 1.7–2.3 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1083).— New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA:** **South Australia:** Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , 20 Dec 2010, V. Ahrens and W.J. Pulawski (SAM).

**PARATYPES:** **AUSTRALIA:** **New South Wales:** 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$ , 19 Dec 2009, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Homestead Gorge in Mutawintji National Park at  $31^{\circ}17'S$   $142^{\circ}18'E$ , 7–13 Oct 1988, E.D. Edwards (1 ♀, ANIC); Kinchega National Park at  $32^{\circ}23.7'S$   $142^{\circ}22.7'E$ , 18 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 15 km W Narrandera, 24 Nov 1991, N.W. Rodd (1 ♀, AMS); Paroo Darling National Park at  $30^{\circ}51.9'S$   $143^{\circ}05.5'E$ , 14 Dec 2011, V. Ahrens and W.J. Pulawski (5 ♀, 7 ♂, CAS); Wallaroi Creek 1.5 km S Condobolin, 27 Dec 1976, Z. Liepa (1 ♀, ANIC); White Cliffs at  $30^{\circ}51.0'S$   $143^{\circ}06.3'E$ , 13 Dec 2011, V. Ahrens and W.J. Pulawski (1 ♀, 1 ♂, CAS); Wyvern Bringagee, 29 Oct 1947, V. Robb (2 ♂, AMS). **Northern Territory:** 32 km WNW Alice Spring at  $23^{\circ}36'S$   $133^{\circ}35'E$ , 8 Oct 1978, J.C. Cardale (2 ♂, ANIC, one headless; 1 ♂, CAS); Standley Chasm NW Jay Creek, 4 Oct 1972, Z. Liepa (1 ♂, ANIC). **Queensland:** Bluff Range near Biggenden, 7 Jan 1972, H. Frauca (1 ♂, ANIC); Eungella National Park, 16–19 Oct 1979, H.E. Evans, M.A. Evans, and A. Hook (1 ♀, QMB); Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$ , 28 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, 1 ♂, CAS); 48 km E Mount Surprise at  $18^{\circ}09.0'S$   $144^{\circ}43.6'E$ , 21 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, 1 ♂, CAS); 35 km SW Moura at  $24^{\circ}48'S$   $149^{\circ}46'E$ , 23 Oct 1992, P. Macnicol (1 ♂, ANIC); 61 km S Rolleston at  $24^{\circ}59.7'S$   $148^{\circ}27.8'E$ , 1 Dec 2012, V. Ahrens and W.J. Pulawski (1 ♀, 2 ♂, CAS); 6 km N Taroom at  $25^{\circ}36'S$   $149^{\circ}46'E$ , 2 Oct 1992, G. Daniels (1 ♂, QMB). **South Australia:** Aroona Ruins in Flinders Ranges National Park at  $31^{\circ}17'S$   $138^{\circ}35'E$ , 9 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♂, CAS); Brachina Gorge in Flinders Ranges National Park at  $31^{\circ}20'S$   $138^{\circ}34'E$ , 4–10 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♀, ANIC); Dingly Dell Camp on Orparinna Creek in Flinders Ranges National Park at  $31^{\circ}21'S$   $138^{\circ}42'E$ , I.D. Naumann and J.C. Cardale, 4–10 Nov 1987 (3 ♀, ANIC) and 7 Nov 1987 (1 ♂, ANIC); Gawler National Park at  $32^{\circ}35.1'S$   $135^{\circ}26.3'E$ , V. Ahrens and W.J. Pulawski, 5 Jan 2011 (1 ♀, 6 ♂, CAS) and 7 Jan 2011 (1 ♀, 2 ♂, CAS) and at  $32^{\circ}35.4'S$



FIGURE 1083. Collecting localities of *Pison sulcatum* Pulawski, sp. nov.



135°21.1'E, 7 Jan 2011 (1 ♂, CAS); 19 km N Renmark at 34°00'S 140°47'E, K.R. Pullen, 7 Sept – 12 Oct 1995 (2 ♂, ANIC) and 10 Oct – 9 Nov 1995 (1 ♀, ANIC); Trezona Camp at Brachina Creek in Flinders Ranges National Park at 31°20'S 138°37'E, I.D. Naumann and J.C. Cardale, 4–10 Nov 1987 (2 ♀, ANIC) and 10 Nov 1987 (1 ♀, ANIC); same locality and collectors as holotype, 20 Dec 2010 (31 ♀, 8 ♂, CAS), 21 Dec 2010 (31 ♀, 7 ♂, CAS), 22 Dec 2010 (21 ♀, 1 ♂, CAS), 27 Jan 2011 (8 ♀, 5 ♂, CAS), 28 Jan 2011 (2 ♀, CAS); 3 km ENE Wilpena at 31°31.0'S 138°36.6'E, same collectors, 23 Dec 2010 (4 ♀, 7 ♂, CAS), 26 Jan 2011 (24 ♀, 14 ♂, CAS), 27 Jan 2011 (60 ♀, 12 ♂, CAS; 1 ♀, 1 ♂, NHMW); Wirreanda Creek 28 km SW Hawker at 32°05.9'S 138°17.7'E, 26 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Western Australia:** 10 km W Cobra Station at 24°10.2'S 116°23.0'E, 26 Apr – 10 May 2003, M.E. Irwin and F.D. Parker (1 ♂, USU); 22 km E Cobra Station at 24°13.3'S 116°33.1'E, 26 Apr – 10 May 2003, M.E. Irwin and F.D. Parker (1 ♀, USU); 12 km ENE Comet Vale Siding at 29°57'S 121°07'E, 7–15 Mar 1979, T.F. Houston (1 ♂, WAM); Great Northern Highway at 23°02.6'S 118°50.2'E, 23 Apr – 10 May 2003, M.E. Irwin and F.D. Parker (1 ♀, USU); Hamelin Telegraph Station at 26°23.9'S 114°09.9'E, 8 Nov 2008, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Karijini National Park at 22°26.3'S 118°22.9'E, 23 Apr – 4 May 2003, M.E. Irwin and F.D. Parker (2 ♀, USU); Karratha at 20°44.4'S 116°50.2'E, 19–29 Apr 2003, M.E. Irwin and F.D. Parker (1 ♀, USU); 28 mi. E Leonora, 18 Sept 1962, E.S. Ross and D.Q. Cavagnaro (10 ♀, 87 ♂, CAS); 133 km SW Marble Bar = 17 km E Woodstock Station at 21°41.6'S 119°04.8'E, 3–16 May 2003, M.E. Irwin and F.D. Parker (1 ♀, USU); 65 km E Nanutarra Road House at 22°27.8'S 116°02.6'E, 5–12 May 2003, M.E. Irwin and F.D. Parker (2 ♂, CAS); 45 km S Newman on Great Northern Highway at 23°42.4'S 119°44.3'E, 23 and 24 Apr – 6 May 2003, M.E. Irwin and F.D. Parker (2 ♀, 2 ♂, ANIC; 1 ♂, CAS; 1 ♂, USU); 47 km S Pardoo Roadhouse on Shay Gap road at 20°22.7'S 120°01.3'E, 1–14 May 2004, M.E. Irwin and F.D. Parker (5 ♀, CAS); 30 km ESE Three Rivers Station at 25°13.6'S 118°56.9'E, 24 Apr – 7 May 2003, M.E. Irwin and F.D. Parker (4 ♀, ANIC).

***Pison tegulare* Pulawski, species nova**

Figures 1084–1091.

**NAME DERIVATION.**—*Tegulare* is a Latin neuter adjective derived from *tegula*, which is unusually long in this species.

**RECOGNITION.**—*Pison tegulare* shares with *P. curiosum* an unusually long tegula, extending beyond the anterior margin of the axilla. It differs in having the tegula nearly completely punctate and setose (only a narrow, marginal rim is impunctate and asetose), with the inner margin concave posteriorly and the yellowish brown mandible (except basally and apically), and in the female the lower gena and the forefemur with a psammophore and the lower gena impunctate and asetose between the oral fossa and the psammophore. In *P. curiosum*, the tegula is largely impunctate and asetose, with the inner margin convex posteriorly, the mandible is black except brown apically, and in the female the lower gena and the forefemur have no psammophore, and the lower gena is punctate and setose on each side of the oral fossa.

Two undescribed forms have the tegula identical as in *tegulare*; they may be individual variants of *tegulare* or closely related species. They differ as follows:

a. clypeal lip of female markedly more prominent (1 ♀ from 23 km SE Cobar, New South Wales, ANIC; 1 ♀ from Karijini National Park, Western Australia, ANIC).

b. male flagellum longer, e.g., dorsal length of flagellomere II is  $2.2 \times$  its apical width, rather than  $1.9 \times$  (1 ♂, Kakadu National Park, Northern Territory, ANIC).

**DESCRIPTION.**—Frons dull, punctures compressed against each other, middle supraantennal carina largely replaced by flat line. Occipital carina narrowly separated from hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Propleuron impunctate or nearly so over most of its surface. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart (several punctures may be

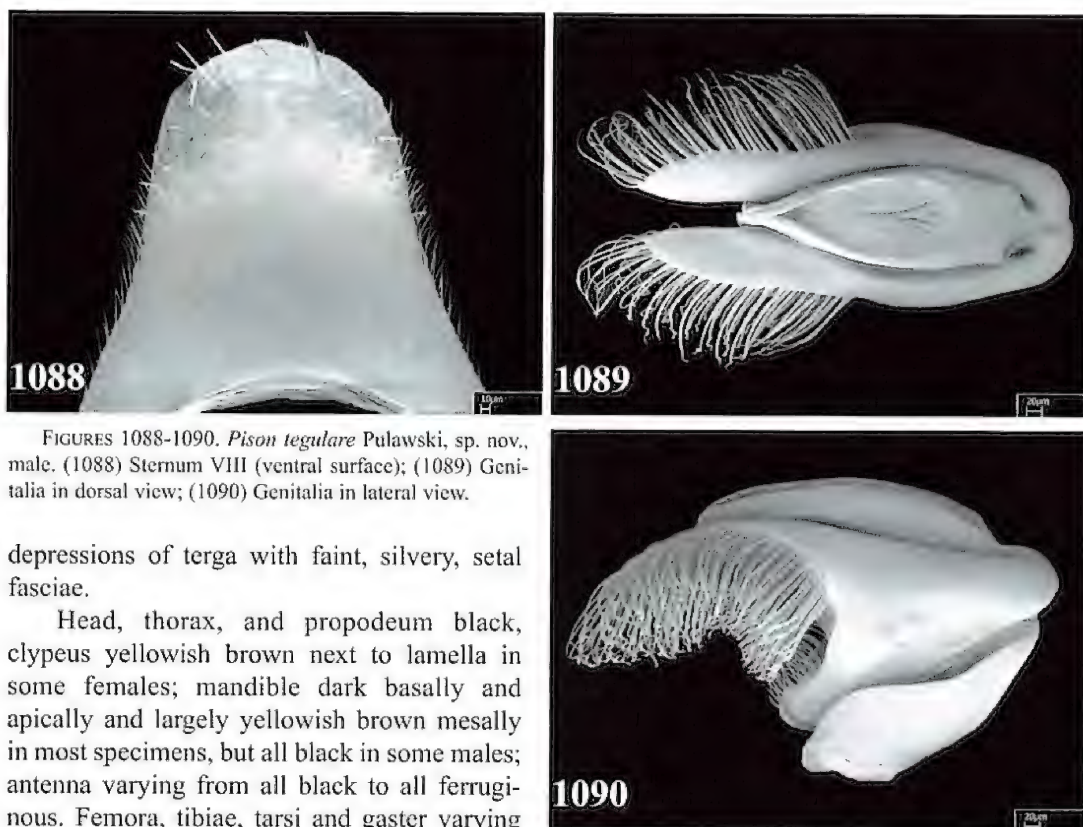


FIGURES 1084-1087. *Pison tegulare* Pulawski, sp. nov. (1084) Female clypeus with broad lamella and mandible; (1085) Female clypeus with narrow lamella; (1086) Male clypeus; (1087) Female tegula and adjacent scutum.

more than one diameter apart); interspaces unsculptured (Fig. 1087). Tegula conspicuously elongate, extending beyond anterior margin of axilla, with inner margin concave posteriorly, punctate throughout except for narrow marginal rim (Fig. 1087). Mesopleural punctures compressed against each other, partly concealed by vestiture. Postspiracular carina present, varying from slightly longer than half midocellar diameter to about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum closely punctate (interspaces in many specimens forming minute ridges), with longitudinal ridges basally, and in some specimens with short transverse ridges emerging from middle carina; side punctate, interspaces confluent into small ridges; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface closely punctate, punctures nearly compressed against each other. Hindcoxae dorsum with outer margin not carinate. Punctures of tergum I, on horizontal part, varying from less than to more than one diameter apart. Punctures of sternum II several diameters apart medially, minuscule in most specimens, but some punctures larger in female from Mount Augustus National Park, Western Australia, and all punctures larger in male from the same Park; apical depression impunctate mesally.

Setae silvery, appressed on frons, scutum, and tergum I, oriented ventrolaterally on frons; largely concealing integument on clypeus (except lamella); lower gena in male with several suberect setae that are about as long as midocellar diameter (see below for female). Apical





FIGURES 1088-1090. *Pison tegulare* Pulawski, sp. nov., male. (1088) Sternum VIII (ventral surface); (1089) Genitalia in dorsal view; (1090) Genitalia in lateral view.

depressions of terga with faint, silvery, setal fasciae.

Head, thorax, and propodeum black, clypeus yellowish brown next to lamella in some females; mandible dark basally and apically and largely yellowish brown mesally in most specimens, but all black in some males; antenna varying from all black to all ferruginous. Femora, tibiae, tarsi and gaster varying from all ferruginous to all black.

♀.—Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $0.7-0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.4 \times$  hindocellar diameter; eye height equal to  $0.98-1.04 \times$  distance between eye notches. Free margin of clypeal lamella arcuate, lamella varying significantly from narrow (Fig. 1085) to wide (Fig. 1084). Dorsal length of flagellomere I  $2.1-2.2 \times$  apical width, of flagellomere IX  $1.0-1.2 \times$  apical width. Lower gena, mandibular posterior margin, propleural outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.6-0.7 \times$ ,  $0.5-0.8 \times$ , and  $0.7-1.0 \times$ , respectively, of greatest forefemoral width); lower gena shiny, unsculptured, and asetose between oral fossa and psammophore. Mandible: trimmal carina without incision. Length 5.1-5.3 mm; head width 1.6-1.9 mm.

♂.—Upper interocular distance equal to  $0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.0-1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-2.0 \times$  hindocellar diameter; eye height equal to  $0.96-1.0 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1086). Flagellomeres III and IV slightly convex ventrally. Dorsal length of flagellomere I  $1.7 \times$  apical width, of flagellomere X  $0.8-0.9 \times$  apical width. Sternum VIII gently rounded apically, not emarginate, without posterolateral corner (Fig. 1088). Genitalia: Figs. 1089, 1090. Length 4.5-4.6 mm; head width 1.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1091).—New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: Western Australia: Merredin, 12-13 Dec 1935, R.E. Turner (BMNH).

**PARATYPES: AUSTRALIA: New South Wales:** Barnatos Tank 56 mi. W Cobar, 1 Jan 1966, O.W. Richards (1 ♀, BMNH); 23 km SE Cobar at 31°31'S 146°06'E, 3 Dec 1981, I.D. Naumann and J.C. Cardale (1 ♀, ANIC); Coonabarabran, 1 Dec 1991, N.W. Rodd (1 ♀, AMS); 40 km E Gol Gol, 27 Nov 1992, N.W. Rodd (1 ♀, AMS); Springs Creek 68 km SW Wilcannia at 31°44'S 142°41'E, 29 Nov 1981, J.C. Cardale and I.D. Naumann (1 ♀, ANIC). **Northern Territory:** Alice Springs, 5 Oct 1972, Z. Liepa (1 ♀, ANIC); Burulba Billabong in Kakadu National Park, 27 June 1980, I.D. Naumann (1 ♀, 1 ♂, ANIC); West MacDonnell National Park ca 3 km W road to Simpson Gap at 23°41.8'S 133°41.7'E, Ch.M. Palmer, 27 Aug – 27 Sept 2007 (1 ♀, CAS), 27 Sept – 27 Oct 2007 (1 ♂, CAS), 27 Oct – 27 Nov 2007 (2 ♂, NTM). **Queensland:** Amby, 22–27 Nov 1979, H.E. and M.A. Evans and A. Hook (1 ♀, 2 ♂, QMB); 3 km NE Mount Webb at 15°03'S 145°09'E, 1–3 Oct 1980, J.C. Cardale (1 ♀, ANIC). **South Australia:** Brachina Gorge in Flinders Ranges National Park at 31°20'S 138°34'E, 4–10 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♂, CAS); Chowilla Game Reserve 24 air km N Renmark at 34°00.0'S 140°49.4'E, 2, 3, 5, and 6 Dec 2010, V. Ahrens and W.J. Pulawski (4 ♂, CAS); Dingly Dell Camp on Oraparinna Creek at 31°21'S 138°42'E, 4–10 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♀, 1 ♂, ANIC); Everard Park Station (now Mimili): creek near Victory Well, 20 Oct 1970, G. Gross and E. Matthews (1 ♀, SAM); Mount Davies and vicinity, 18–21 Oct 1972, H.E. Evans (2 ♂, ANIC; 1 ♂, CAS); Point Sinclair 19 km S Penong at 32°05.0'S 132°59.0'E, 12 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Quinyambie Station 5.2 km S Coonanna Bore at 29°53'29"S 140°47'21"E, 27 Oct – 1 Nov 2008, Waterhouse Survey, no collector (1 ♂, SAM); Quinyambie Station 22 km NE Coonanna Bore at 29°41'58"S 140°55'56"E, 26–31 Oct 2008, Waterhouse Survey, no collector (3 ♀, 2 ♂, SAM); Quinyambie Station 23.2 km NE Coonanna Bore at 29°42'07"S 140°56'07"E, Waterhouse Survey, no collector, 26–31 Oct 2008 (1 ♀, CAS) and 27 Oct – 1 Nov 2008 (1 ♀, SAM); 14 km WNW Renmark at 34°07'S 140°37'E, 13 Dec 1995 – 25 Jan 1996, K.R. Pullen (1 ♀, CAS); 79 km NNW Renmark at 33°31'S 140°29'E, 24 Jan – 20 Feb 1996, K.R. Pullen (1 ♀, CAS). **Western Australia:** ca 11 km N Jurien Bay at 30°12.4'S 115°00.4'E, 1 Nov 2008, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Karijini National Park at 22°26.3'S 118°22.9'E, M.E. Irwin, and F.D. Parker (1 ♀, CAS); Mount Augustus National Park, M.E. Irwin and F.D. Parker, at 24°18.0'S 116°47.6'E, 25 Apr – 7 May 2003 (1 ♀, ANIC) and 24°22.8'S 116°54.2'E, 9–22 May 2003 (1 ♂, CAS); 158 km S Newman (= 9 km N Kumarina Roadhouse) at 24°37.8'S 119°36.8'E, 7–18 May 2003, F.D. Parker and M.E. Irwin (1 ♂, ANIC).



FIGURE 1091. Collecting localities of *Pison tegulare* Pulawski, sp. nov.

### *Pison tenebrosus* Turner

Figures 1092–1094.

*Pison tenebrosus* Turner, 1908:518. ♀. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. – Turner, 1916b:596 (in key to Australian *Pison*), 600 (wing venation); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:263 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**– Turner did not mention the number of the specimens examined in the original description of *Pison tenebrosus*. I have designated as the lectotype the only specimen in The Natural History Museum, London. It wears a handwritten label "*Pison tenebrosus* Turner. Type".

**RECOGNITION.**– *Pison tenebrosus* has only two submarginal cells, asetose eyes, the tegula punctate throughout, the mid- and hindtibial spurs whitish, and the body either all black or with the legs ferruginous. Only the female is known. It is unique among the species with two submarginal cells in having an omaulus (which is evanescent next to the pronotal lobe).



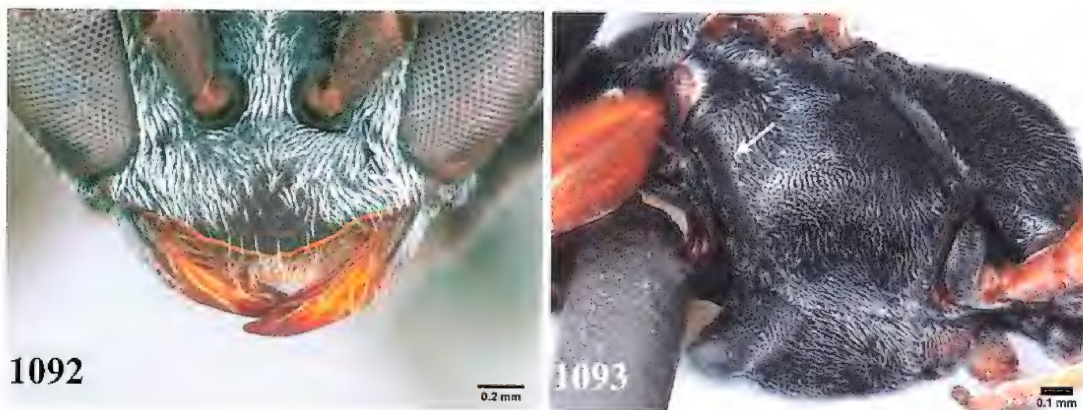
**DESCRIPTION.**—Frons dull, minutely punctate, punctures less than one diameter apart. Distance between antennal sockets slightly larger than distance between socket and adjacent orbit. Occipital carina not joining hypostomal carina. Labrum emarginate. Anteromedian pronotal pit slightly transversely elongate, slightly shorter than midocellar diameter. Scutum foveate along flange, with longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged, finely punctate throughout, fully concealing humeral plate. Mesopleuron with omaulus that is evanescent next to pronotal lobe (Fig. 1093), punctures fine, less than one diameter apart, interspaces dull. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges becoming markedly conspicuous next to longitudinal carina); side and posterior surface microareolate, finely ridged, punctate between ridges. Forewing with two submarginal cells; second submarginal cell short, length of its posterior margin  $1.3 \times$  height. Posteroventral forefemoral surface microscopically, closely punctate. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I less than one diameter apart, interspaces dull. Sterna punctate throughout.

Setae silvery, appressed on thorax, forecoxal venter, femoral venters, and tergum I, oriented dorsally on upper frons, erect on lower gena (about  $0.5 \times$  as long as midocellar diameter). Apical depressions of terga with faint, silvery, setal fasciae.

Body either all black (mandible ferruginous except black basally and apically) or legs ferruginous (some specimens from Western Australia); also antenna ferruginous ventrally in several specimens. Mid- and hindtibial spurs whitish.

♀.—Upper interocular distance equal to  $1.00 \times$  lower interocular distance; ocellocular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5 \times$  hindocellar diameter; eye height equal to  $1.10 \times$  distance between eye notches. Clypeal lamella divided by conspicuous carina into dorsal and ventral parts; free margin inconspicuously, broadly concave between lamella and orbit (Fig. 1092). Dorsal length of flagellomere I  $1.5\text{--}1.7 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Mandible: trimmal carina with small indentation at about two thirds of length. Length 5.6–5.9 mm; head width 1.4–1.5 mm.

♂.—Unknown.



FIGURES 1092–1093. *Pison tenebrosus* Turner, female. (1092) Clypeus and mandibles of lectotype; (1093) Thorax in lateral oblique view (arrow shows omaulus).

**GEOGRAPHIC DISTRIBUTION** (Fig. 1094).— Queensland and Western Australia.

**RECORDS.**— **AUSTRALIA: Queensland:** Bowen (1 ♀, SAM); Mackay (1 ♀, BMNH, lectotype of *Pison tenebrosus*), 13 km SE Weipa at 12°40'S 143°00'E (1 ♀, ANIC). **Western Australia:** 10 km W Cobra Station at 24°10.2'S 116°23.0'E (1 ♀, ANIC), House Creek 65 km E Nanutarra Road House at 22°27.8'S 116°02.6'E (1 ♀, ANIC; 1 ♀, CAS), Nanutarra – Wittenoom road at 22°26'8"S 117°49'56"E (1 ♀, AMS), Yanchep 32 mi N Perth (1 ♀, BMNH); Yandicoogina Creek 30 km E Marble Bar at 21°11.0'S 120°01.7'E (1 ♀, CAS).



FIGURE 1094. Collecting localities of *Pison tenebrosus* Turner.

***Pison tenuipunctatum* Pulawski, species nova**

Figures 1095-1098.

**NAME DERIVATION.**— *Tenuipunctatum* is derived from two Latin words: *tenuis*, meaning *fine*, *delicate*, and *punctatum*, *punctate*; with reference to the fine punctuation of the basal portion of tergum I and of the sterna.

**RECOGNITION.**— *Pison tenuipunctatum* has an all black body, three submarginal cells, and erect setae on tergum I, although these setae are relatively sparse, absent from the basal declivity, and only a few of them are slightly longer than the midocellar diameter. In the other species with erect setae on tergum I (except some *P. vestitum*) these setae are abundant and distinctly longer than the midocellar diameter. The minutely punctate basal declivity of tergum I is a subsidiary recognition feature (the punctures are markedly finer than those on the scutum). The male is unknown.

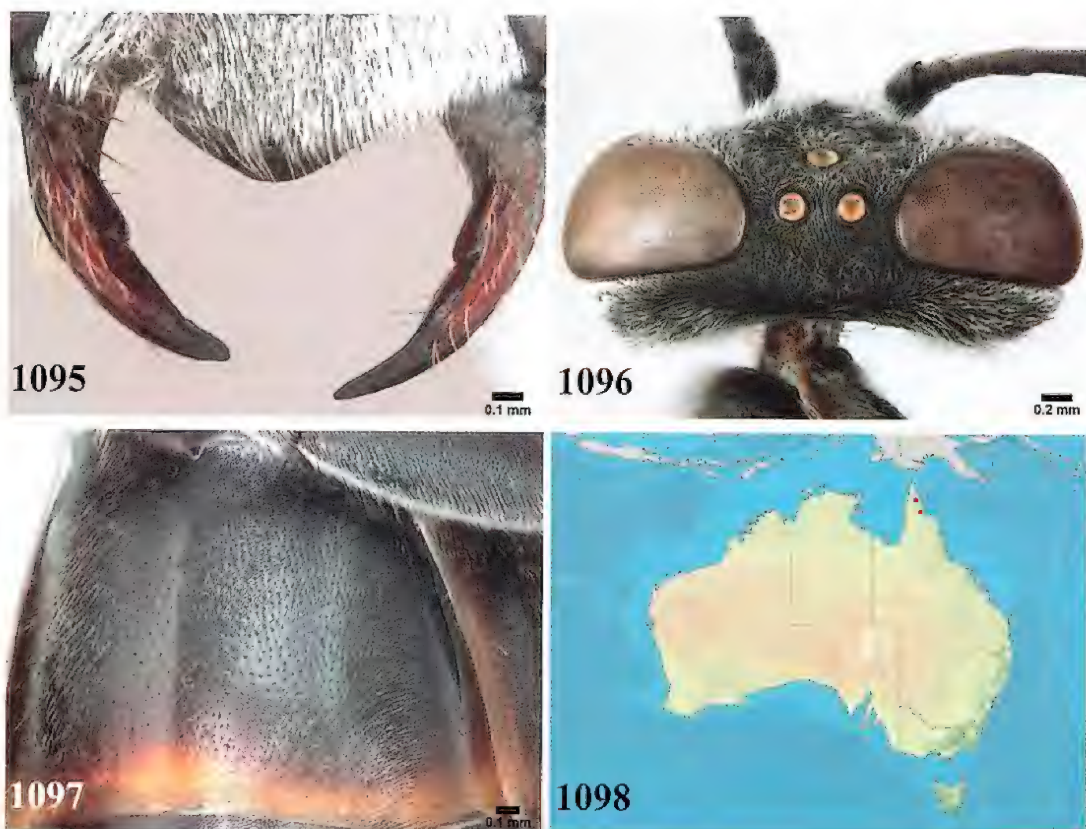
**DESCRIPTION.**— Frons slightly swollen above antennal sockets, dull, finely punctate, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 1096). Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula enlarged. Mesopleural punctures slightly larger than those on scutum, less than one diameter apart; interspaces microsculptured, dull. Postspiracular carina rudimentary, about half as long as midocellar diameter. Metapleural sulcus finely costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely, obliquely ridged, punctate between ridges; side finely ridged, punctate between ridges; posterior surface conspicuously ridged, punctate between ridges. Hindcoxal dorsum with outer margin obtusely carinate. Horizontal part of tergum I finely punctate, punctures about one diameter apart anterior to apical depression, about two diameters apart next to anterior slope. Sterna finely punctate throughout, those of sternum II more than one diameter apart mesally (Fig. 1097).

Setae silvery, erect on upper frons, postocellar area, scutum, and tergum I (here relatively sparse, only a few slightly longer than midocellar diameter, and absent from basal declivity); completely concealing integument on clypeus (except lamella); setae of lower gena erect, sinuous, shorter than basal mandibular width. Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Upper interocular distance equal to  $0.64-0.66 \times$  lower interocular distance; ocellocular





FIGURES 1095-1097. *Pison tenuipunctatum* Pulawski, sp. nov., female. (1095) Clypeus and mandibles; (1096) Head in dorsal view; (1097) Sternum II in lateral oblique view.

FIGURE 1098. Collecting localities of *Pison tenuipunctatum* Pulawski, sp. nov.

distance equal to  $1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.3 \times$  hindocellar diameter; eye height equal to  $0.86-0.90 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 1095), lamella separated from more basal part by fine, transverse carina. Dorsal length of flagellomere I  $2.7-2.8 \times$  apical width, of flagellomere IX  $1.3-1.4 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 10.4-11.2 mm; head width 3.0-3.1 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1098).— Known from three localities in northern Queensland (two of them adjacent).

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: **Queensland**: 3 km W Batavia Downs at  $12^{\circ}40'S$   $142^{\circ}39'E$ , 23 Nov – 11 Dec 1992, P. Zborowski and W. Dressler (ANIC).

PARATYPES: AUSTRALIA: **Queensland**: 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$ , 23 Nov – 11 Dec 1992, P. Zborowski and W. Dressler (1 ♀, ANIC); Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$ , 17 Dec 1993 – 13 Jan 1994 (1 ♀, CAS).

*Pison tenuisculptum* Pulawski, species nova

Figures 1099-1107.

**NAME DERIVATION.**— *Tenuisculptum* is derived from two Latin words: *tenuis*, meaning *fine*, *delicate*, and *sculptum*, sculptured; with reference to the fine body sculpture, particularly on the propodeal dorsum.

**RECOGNITION.**— *Pison tenuisculptum* is a species with the second recurrent vein received near the middle of the second submarginal cell, an all black gaster, and ferruginous femora, tibiae, and tarsi. It differs from most other such species in having a finely punctate propodeal dorsum (also with microscopic, inconspicuous ridges). In addition, the emargination of the inner orbit is the usual shape (not unusually shallow) and tergum I is sessile (its length about equal to apical width). In the female, the distance between the antennal socket and the orbit is about half of the socket width, and in the male the free margin of the clypeal lamella is broadly arcuate (Fig. 1100).

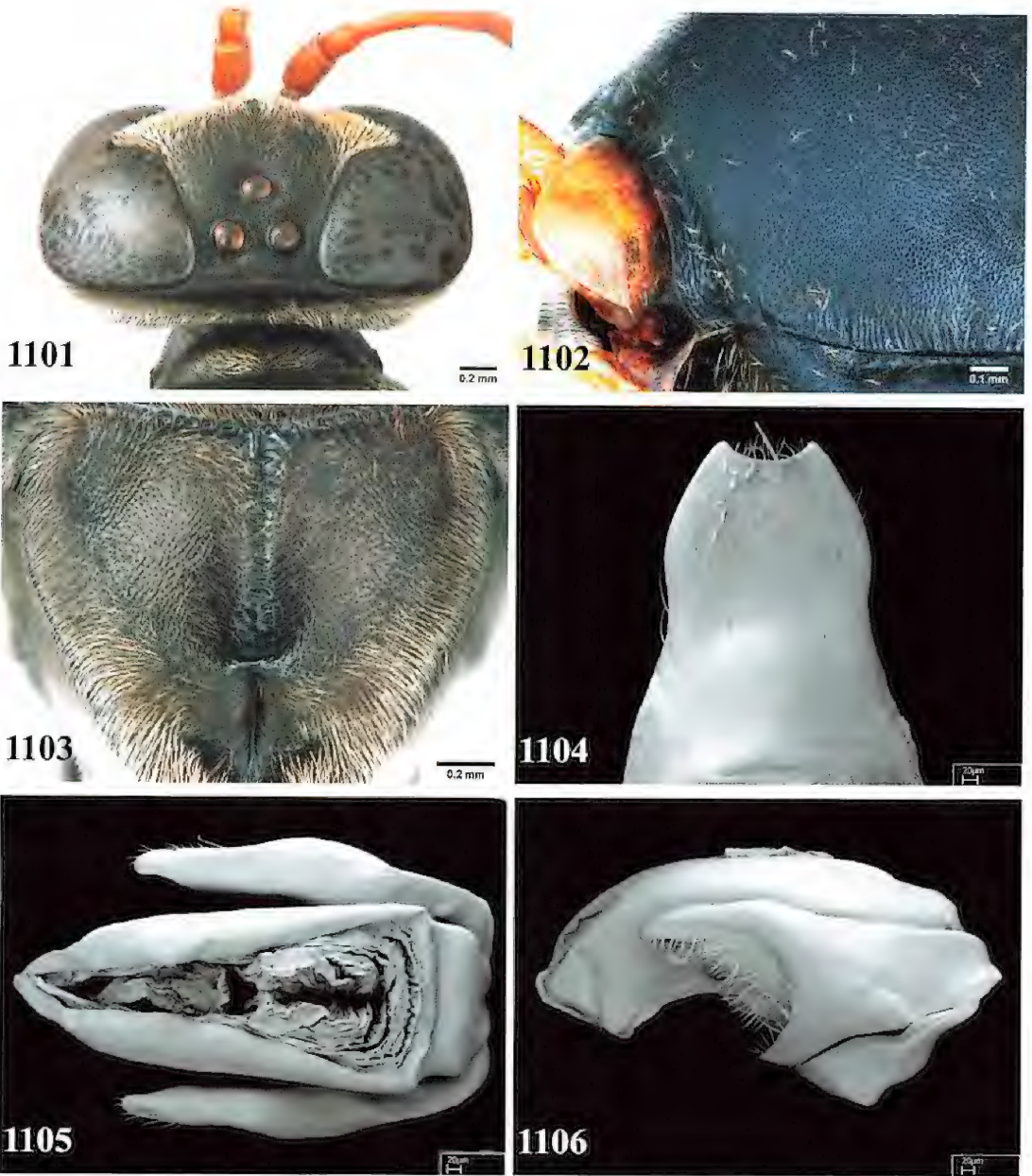
The species is similar to *P. breviclypeatum* (of which only the female is known). In the female of *P. tenuisculptum*, however, the frons is not swollen above the antennal base and the head is not subspherical in dorsal view (Fig. 1101), the clypeal lamella is conspicuously protruding beyond the free margin of the lateral section (Fig. 1099), the dorsal length of flagellomere I is  $2.8 \times$  apical width, the terga are covered with golden setae, and the length is 8.1-9.3mm. In the female of *P. breviclypeatum*, the frons is swollen above the antennal base (Fig. 211), the head is subspherical in dorsal view (Fig. 211), the clypeal lamella only insignificantly protrudes beyond the free margin of the lateral section (Fig. 211), the dorsal length of flagellomere I  $1.6 \times$  apical width, the terga are covered with inconspicuous silvery setae, and the length is about 5.5 mm.

**DESCRIPTION.**— Frons dull, minutely punctate, punctures ill defined, about one diameter apart. Distance between antennal socket and orbit equal to about half socket width in female, about equal to socket width in male. Gena narrow in dorsal view (Fig. 1101). Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as half midocellar diameter. Scutum finely foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart; interspaces dull (Fig. 1102). Tegula slightly enlarged. Mesopleural punctures minute, even, about one diameter apart. Postspiracular carina present, almost twice as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum minutely punctate, punctures less than one diameter apart laterally, but becoming sparser toward midline (Fig. 1103), many



FIGURES 1099-1100. *Pison tenuisculptum* Pulawski, sp. nov. (1099) Female clypeus and mandibles; (1100) Male clypeus and mandibles.





FIGURES 1101-1106. *Pison tenuisculptum* Pulawski, sp. nov. (1101) Female head in dorsal view; (1102) Female tegula and adjacent scutum; (1103) Propodeal dorsum of female; male: (1104) Sternum VIII (ventral surface); (1105) Genitalia in dorsal view; (1106) Genitalia in lateral view.

interspaces merging into fine to microscopic ridges; side microsculptured, minutely punctate, impunctate anteriorly; posterior surface finely punctate. Second recurrent vein received near middle of second submarginal cell. Posteroventral forefemoral surface microscopically, closely punctate. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I minute, in some specimens up to several diameters apart on horizontal part. Sternum II except laterally and sternum III mesally minutely microareolate, with microscopic punctures that are many diameters apart.

Setae golden or silvery with golden tinge, appressed on upper frons, scutum, and tergum I, oriented ventrally between midocellus and antenna; completely concealing integument on clypeus (except lamella); on lower gena suberect, about two-thirds of midocellar diameter. Tergal setae golden in female, in male silvery with golden tinge, forming fasciae on apical depressions.

Head, thorax, propodeum, and gaster black, female clypeus yellowish next to lobe free margin; mandible black basally, then yellowish, brown subbasally, and dark brown apically; antenna ferruginous, apical flagellomere dark. Femora, tibiae, and tarsi ferruginous, forefemur dark basodorsally in most specimens.

♀.—Upper interocular distance equal to  $1.04\text{--}1.06 \times$  lower interocular distance; ocellocular distance equal to  $0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6\text{--}0.7 \times$  hindocellar diameter; eye height equal to  $1.12\text{--}1.14 \times$  distance between eye notches. Free margin of clypeal lamella approximately truncate (Fig. 1099). Dorsal length of flagellomere I  $2.8 \times$  apical width, of flagellomere IX  $1.0\text{--}1.1 \times$  apical width. Mandible: trimmal carina with small incision at about one third length. Length 8.1–9.3 mm; head width 2.1–2.2 mm.

♂.—Upper interocular distance equal to  $0.94 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $1.16 \times$  distance between eye notches. Free margin of clypeal lamella broadly arcuate (Fig. 1000). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere X  $0.8 \times$  apical width. Sternum VIII shallowly emarginate apically (Fig. 1104). Genitalia are unusual in having gonocoxite markedly shorter than penis valve: Fig. 1105, 1106. Length 7.2 mm; head width 2.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1107).—Eastern New South Wales, eastern Queensland.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: New South Wales: Lorien 3 km N Landowne near Taree, 25–27 Nov 1987, D.J. Bickel (AMS).

PARATYPES: AUSTRALIA: New South Wales: same data as holotype (1 ♂, AMS); Catherine Hill Bay, 2 Dec 1962, E.S. Ross and D.O. Cavagnaro (1 ♀, CAS); Elizabeth Bay [in Sydney], 24 Jan 1952, no collector (2 ♀, AMS). **Queensland:** Crediton State Forest at  $21^{\circ}11.8'S$   $148^{\circ}29.9'E$ , 31 Oct 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$ , 6 Nov 2012, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Kroombit Tops State Forest: Kroombit Creek at  $24^{\circ}23'S$   $151^{\circ}02'E$ , 31 Oct – 2 Nov 1999, D.J. Bickel (1 ♀, AMS); 18 km S Ravenshoe, 16 Oct 1984, N.W. Rodd (1 ♀, AMS).



FIGURE 1107. Collecting localities of *Pison tenuisculptum* Pulawski, sp. nov.



***Pison terrigena* Pulawski, species nova.**

Figures 1108-1113.

**NAME DERIVATION.**— *Terrigena* is a Latin noun meaning *born from the earth, son of the earth*, a noun in apposition to the generic name; also with reference to this species origin in the Northern Territory of Australia.

**RECOGNITION.**— The male of *P. terrigena* (the female is unknown) is all black (mandible yellowish) and has three submarginal cells, the propodeum without a longitudinal carina separating the side from the dorsum and the posterior surface, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. It differs from similar species by the following combination: punctures of frons and scutum well defined; clypeal lamella acutely angulate; scutal punctures less than one diameter apart; ocellocular distance equal to  $0.8 \times$  hindocellar diameter; dorsal length of flagellomere I  $2.0 \times$  apical width; setae of lower gena nearly as long as midocellar diameter; sternum II with large punctures, impunctate apicomeresally; sterna IV and V with a few sparse punctures (except punctures closer to each other near the lateral margin); apical margin of sternum VIII slightly emarginate and with obtuse apicolateral corner (Fig. 1110).

**DESCRIPTION.**— Frons dull, finely punctate, punctures somewhat ill defined, less than one diameter apart, supraantennal carina replaced by thin sulcus. Occipital carina joining hypostomal carina. Gena narrow in dorsal view (Fig. 1109). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, nearly contiguous except narrowly separated laterally in holotype (less than one diameter apart). Tegula not enlarged. Mesopleural punctures contiguous. Postspiracular carina present, almost as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum rugose, with short transverse ridges emerging from midline; side finely ridged, rugose between ridges; posterior surface inconspicuously, irregularly ridged transversally, rugose between ridges. Posteroventral forefemoral surface minutely, closely punctate. Punctures of tergum I, anterior of apical depression, averaging about one diameter apart (except nearly contiguous laterally). Sternum II with large punctures, impunctate apicomeresally; sterna IV and V with a few sparse punctures (except punctures closer to each other near lateral margin).

Setae silvery, appressed on frons, postocellar area, scutum, and tergum I; oriented dorsally on upper frons (except near orbit); on lower gena curved, nearly as long as midocellar diameter, mostly subappressed, but a few setae erect; completely concealing integument on clypeus (except lamella). Apical depressions of terga with silvery, setal fasciae.

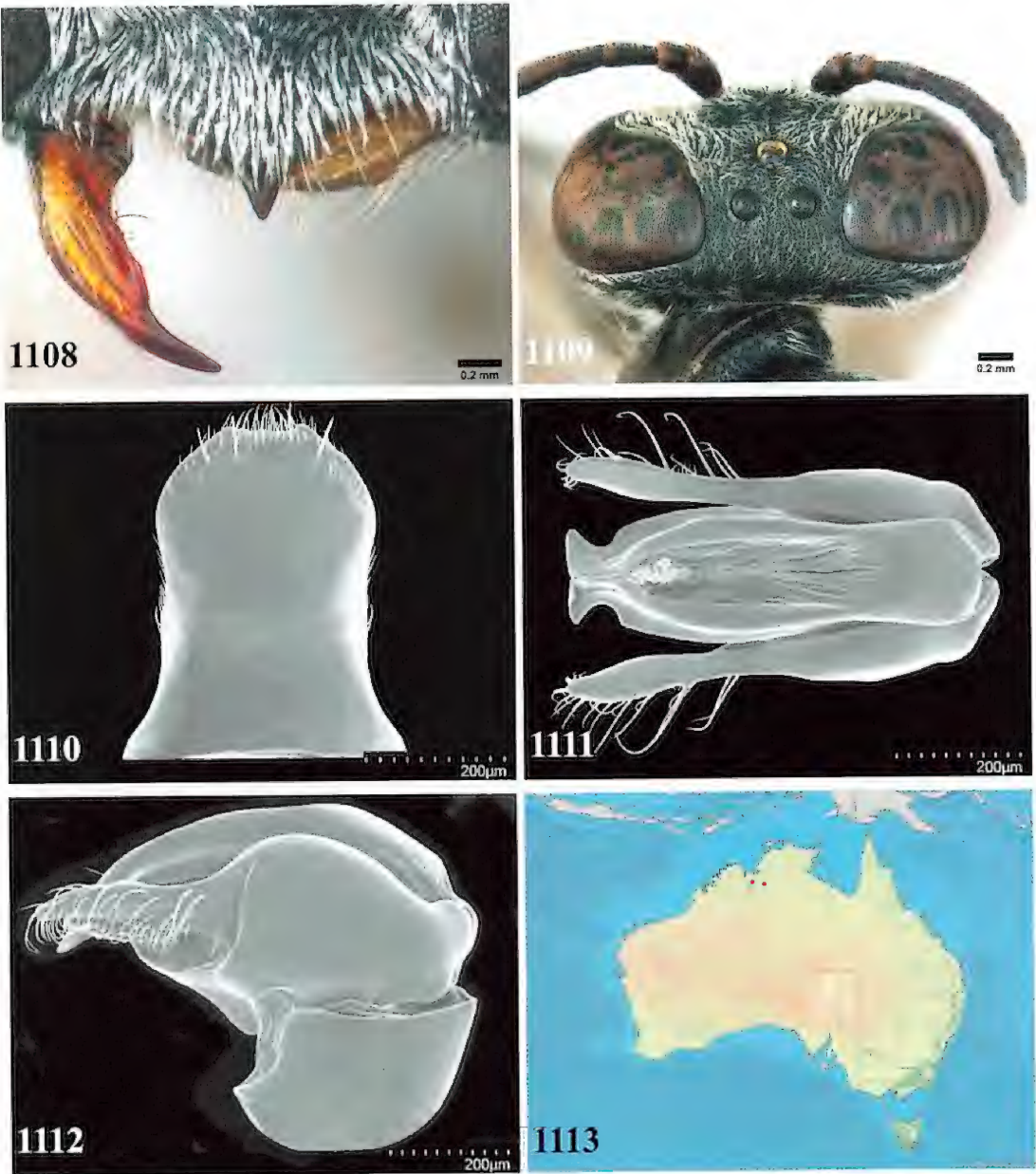
Body black, mandible yellowish, brown apically.

♀.— Unknown.

♂.— Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.0 \times$  hindocellar diameter; eye height equal to  $0.96-1.00 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1109). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII with apical margin shallowly emarginate, with obtuse apicolateral corner (Fig. 1110). Genitalia: Figs. 1111, 1112. Length 6.5-7.5 mm; head width 1.9-2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1113).— Northern part of Northern Territory.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: Northern Territory: Keep River National Park at  $15^{\circ}57'55''\text{S}$   $129^{\circ}01'52''\text{E}$ , 10-13 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).



FIGURES 1108-1112. *Pison terrigena* Pulawski, sp. nov., male. (1108) Clypeus and mandible; (1109) Head in dorsal view; (1110) Sternum VIII (vental surface); (1111) Genitalia in dorsal view; (1112) Genitalia in lateral view.  
FIGURE 1113. Collecting localities of *Pison terrigena* Pulawski, sp. nov.



PARATYPE: AUSTRALIA: Northern Territory: Gregory National Park at 16°12'47"S 130°25'11"E, 12-15 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS).

***Pison tibiale* F. Smith**

Figures 1114-1122.

*Pison tibiale* F. Smith, 1869:292, ♂ (as *tibialis*, incorrect original termination). Lectotype: ♂, Australia: Western Australia: no specific locality (BMNH), **present designation**, examined. – Kohl, 1885:188 (in checklist of world *Pison*); Froggatt, 1892:218 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*), 610 (description, as *tibialis*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:263 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Smith (1869) did not give the number of specimens examined in the original description of *Pison tibiale*. I have designated as the lectotype of this species the only specimen present in The Natural History Museum, London, a male bearing a printed label "W. Australia" and a handwritten label "*tibialis* Sm. Type".

**RECOGNITION.**— *Pison tibiale* has a black gaster (apical depressions of terga brown) and abundant erect setae on the head, thorax, propodeum, and the basal half of tergum I. The female can be recognized by the clypeal lamella divided by an ill-defined, arcuate sulcus next to the free margin into dorsal and ventral portions (Fig. 1116), the ocellocular distance equal to  $1.4\text{--}1.8 \times$  hindocellar diameter, and in most specimens conspicuously punctate sternum II (Fig. 1117). The clypeal lamella is undivided in the other species with erect setae on tergum I except for *P. tenuipunctatum* (in which sternum II is minutely punctate) and to some extent in *P. flagellarium* (in which the ocellocular distance is about  $0.9 \times$  hindocellar diameter). Also, the tibiae are ferruginous in most *P. tibiale*, but black in the other two species. The male is distinctive in having a setose median sulcus on sternum VIII (Fig. 1118, 1119), the sternum surface otherwise largely unsculptured and asetose (except finely punctate and setose apically and laterally). A median sulcus on sternum VIII is also present in *P. sulcatum* in which the body setae are appressed.

**DESCRIPTION.**— Frons dull, punctures less than one diameter apart. Occipital carina joining hypostomal carina. Labrum slightly emarginate mesally. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin. Scutal and mesopleural punctures well defined, less than one diameter apart. Tegula slightly enlarged. Postspiracular carina absent. Metapleural sulcus not costulate to slightly costulate between dorsal and ventral metapleural pits. Propodeum with or without irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina ranging from absent to well defined); dorsum with well-defined punctures, interspaces merging into conspicuous, irregular, oblique ridges; sulcus with short, oblique carinae emerging from middle carina; side punctate, interspaces merging into irregular ridges; posterior surface punctate and irregularly transversely ridged. Posteroventral forefemoral surface with well-defined punctures that are about 1-2 diameters apart in female, about one diameter apart in male. Hindcoxal dorsum with outer margin sharply carinate (except basally). Hindfemur thickened apicodorsally, more so in male than in female. Punctures of tergum I less than one diameter apart adjacent to apical depression, up to several diameters apart on anterior declivity in female, averaging about one diameter apart in male. Sternum II coarsely punctate throughout in most specimens (Fig. 1117), finely punctate in some.

Setae silvery, erect on frons, thorax, propodeum, tergum I (except posteriorly), forecoxal venter, femoral venters, and male sterna; setae not obscuring integument on clypeus in female, obscuring in male; genal setae erect, sinuous. Setal length, expressed as a fraction of midocellar



FIGURES 1114-1117. *Pison tibiale* F. Smith. (1114) Female clypeus and mandibles; (1115) Male clypeus and mandibles; (1116) Clypeal lamella of female in oblique view (arrow shows sulcus); (1117) Female sternum II and part of sternum III.

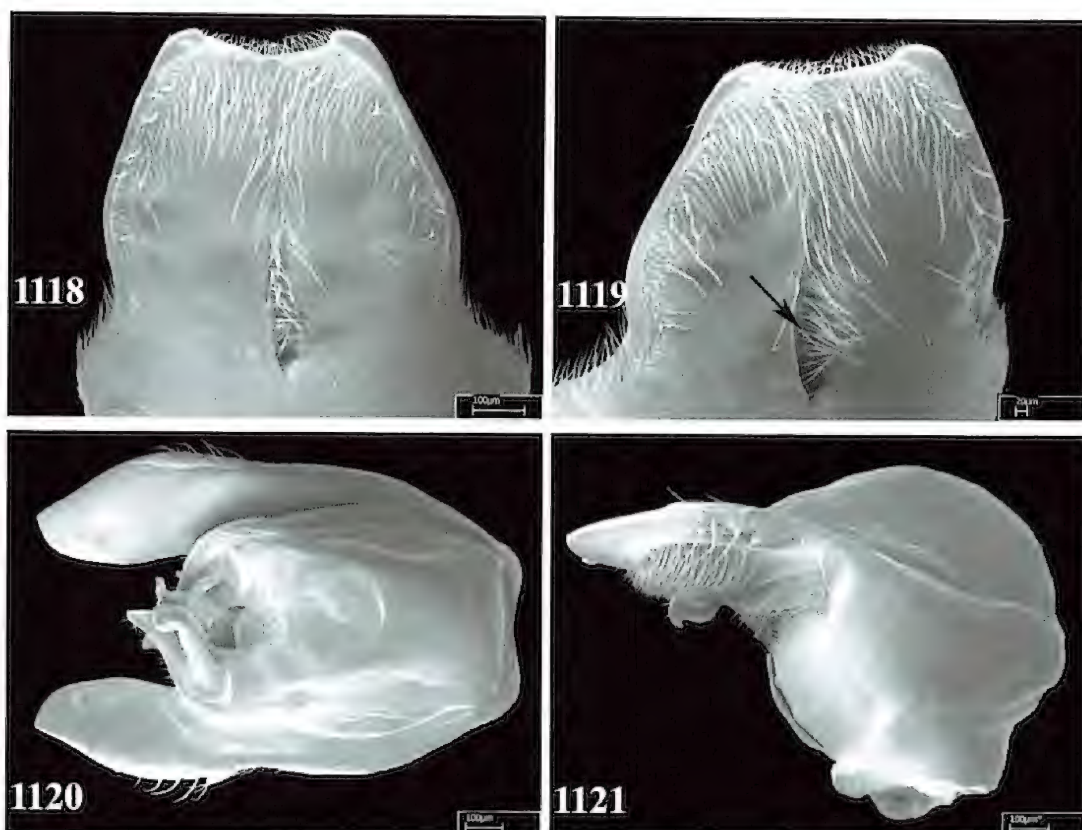
diameter, about  $1.5 \times$  on scutum anteriorly and tergum I, up to about  $2.2 \times$  on lower gena, at least  $1.0 \times$  on hindfemoral venter and male sternum II.

Head, thorax, propodeum, and gaster black, including antenna and mandible; apical depressions of terga brown (only apically on tergum I). Fore- and midfemora black (midfemur ferruginous apically in many specimens), hindfemur varying from all black (most specimens) to all ferruginous; tibiae and tarsi mostly ferruginous, but all legs black in specimens from Canberra, Australian Capital Territory; Gregory National Park, some from Keep River National Park, female from Groote Eylandt, Northern Territory; and Ban Ban Range, 4 km NE Batavia Downs, Cordalia State Forest, 2 km N Rokeby, and Watalgan Range, Queensland. Apical depressions of terga (including tergum II) with setal fasciae; fasciae silvery with golden tinge to golden.

♀.— Upper interocular distance equal to  $0.80-0.84 \times$  lower interocular distance; ocellocular distance equal to  $1.4-1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.3 \times$  hindocellar diameter; eye height equal to  $0.86-0.92 \times$  distance between eye notches. Clypeal lamella narrowly arcuate, divided by ill-defined, arcuate sulcus next to free margin into dorsal and ventral portions; free margin obtusely angulate (Figs. 1115, 1116). Dorsal length of flagellomere I  $2.3-2.4 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with incision at about two thirds of length, proximal portion of incision forming well-defined tooth in some specimens. Tergum VI pointed apically. Length 8.4-9.6 mm; head width 2.8-3.2 mm.

♂.— Middle clypeal section conspicuously convex. Upper interocular distance equal to





FIGURES 1118-1121. *Pison tibiale* F. Smith, male. (1118) Sternum VIII (ventral surface); (1119) Sternum VIII in slightly oblique lateral view (arrow shows median impression); (1120) Genitalia in dorsal view; (1121) Genitalia in lateral view.

0.90-0.94  $\times$  lower interocular distance; ocellocular distance equal to  $1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.3 \times$  hindocellar diameter; eye height equal to  $0.88-0.92 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1115). Dorsal length of flagellomere I  $2.0-2.3 \times$  apical width, of flagellomere X  $0.9-1.1 \times$  apical width. Sternum VIII largely unsculptured (punctate and setose apically and laterally), at most with a few large, sparse punctures, with well-defined, setose median impression; apical margin shallowly, broadly emarginate (Figs. 1118, 1119). Genitalia: Figs. 1120, 1121. Length 6.8-10.3 mm; head width 2.3-2.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1122).—Whole Australia except Tasmania.

**RECORDS.**— **AUSTRALIA:** **Australian Capital Territory:** Canberra (2 ♀, ANIC). **New South Wales:** Billabong Creek near Conargo (1 ♀, ANIC), 6 km NE Bilpin (3 ♀, 3 ♂, AMS), Clarence in Blue Mountains (1 ♂, AMS), 119 km W Cobar at  $31^{\circ}33.5'S$   $144^{\circ}37.6'E$  (1 ♂, CAS), Combogolong (1 ♂, AMS), Condobolin (1 ♀, AMS), Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$

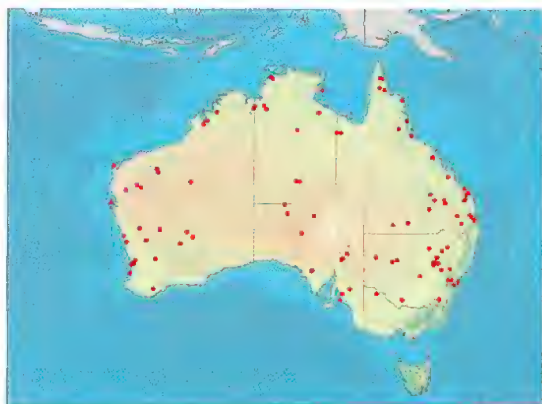


FIGURE 1122. Collecting localities of *Pison tibiale* F. Smith.

148°40.5'E (4 ♀, 13 ♂, CAS), 1 km W Eumungerie at 31°56.7'S 148°36.9'E (1 ♀, 4 ♂, CAS), Gilgandra (2 ♀, 1 ♂, AMS), Gilgandra Flora Reserve at 31°39.7'S 148°46.3'E (11 ♂, CAS), Goonoo State Forest 5 mi S Mendooran (1 ♂, AMS), 2 mi. S Mendooran (1 ♀, AMS), Mootwingi National Park at 31°17'S 142°18'E (1 ♀, ANIC), Mount Kaputar National Park at 30°15.8'S 150°03.3'E (1 ♀, 3 ♂, CAS) and 30°16.2'S 150°06.1'E, 900 m (2 ♀, 8 ♂, CAS), 16 km N Mudgee (1 ♀, ANIC), 40.5 km SW Narrabri at 30°37.7'S 149°34.1'E (4 ♀, 11 ♂, CAS), Pearl Beach (1 ♀, ANIC), Warrenburg National Park (7 ♀, 3 ♂, UCD), Warrumbungle National Park at 31°16.9'S 148°59.1'E (1 ♀, 2 ♂, CAS) and at 31°16'S 148°57'E (18 ♀, 13 ♂, MNKB), near Warrumbungle National Park at 31°16.9'S 149°04.8'E (2 ♀, 4 ♂, CAS), Western Sydney Regional Park at 33°51.6'S 150°51.3'E (1 ♀, 3 ♂, CAS), 87 km E Wilcannia at 31°42.8'S 144°08.6'E (11 ♀, 8 ♂, CAS), Wolllemi National Park (northern edge) at 32°23.4'S 150°24.8'E (2 ♀, 3 ♂, CAS). **Northern Territory:** 12-17 mi. E Alice Springs (1 ♀, ANIC), 72 km W Alice Springs at 23°48.5'S 122°13.4'E (1 ♂, CAS), Cox Peninsula road at Middle Arm turnoff (1 ♂, NTM), Darwin (1 ♂, SAM), Gregory National Park at 16°03'01"S 130°04'07"E (1 ♀, CAS), Groote Eylandt (1 ♀, SAM), Keep River National Park at 15°45'44"S 129°05'55"E (1 ♀, ANIC), 15°57'33"S 129°01'44"E (1 ♀, ANIC), and 15°57'55"S 129°01'52"E (1 ♀, 1 ♂, ANIC; 1 ♀, CAS), McArthur River 48 km SSW Borroloola at 16°27'S 136°05'E (1 ♀, ANIC), Renner Springs (1 ♀, CAS), Victoria Highway 38.5 km SW Timber Creek at 15°42'40"S 130°07'48"E (1 ♀, ANIC), West MacDonnell National Park ca 3 km W road to Simpson Gap at 23°41.8'S 133°41.7'E (5 ♀, NTM). **Queensland:** Amby (1 ♀, 2 ♂, QMB), Ban Ban Range = Bin Bin Range (2 ♀, 1 ♂, ANIC), 4 km NE Batavia Downs (3 ♀, 3 ♂, ANIC), Bluff Range S Bigedden (1 ♀, ANIC), Brisbane: Blunder Creek (1 ♀, QMB), Brisbane: Karawatha Forest at 27°38.6'S 153°04.2'E (4 ♂, CAS), Bundaberg (1 ♂, ANIC), N Bundaberg (1 ♂, ANIC), Carnarvon National Park (1 ♀, QMB), Coen at 13°57'S 143°12'E (1 ♀, ANIC), Condamine River 8 km SW Dalby at 27°13.2'S 151°11.0'E (1 ♂, CAS), Cordalba State Forest 29 and 27 km SW Bundaberg (1 ♀, 1 ♂, ANIC), Crater Lake National Park SW Biggenden (1 ♀, 2 ♂, ANIC), Crediton State Forest at 21°11.8'S 148°29.9'E (1 ♂, AMNH; 1 ♂, CAS) and 21°11.8'S 148°29.7'E (2 ♀, 5 ♂, CAS), 25 km N Cunnamulla (1 ♂, QMB), Dynevor Lakes at 28°05'S 144°12'E (1 ♀, QMB), Eungella National Park at 21°10.5'S 148°30.3'E (3 ♂, CAS; 1 ♀, QMB), Gooburrum Shire near Bundaberg (1 ♂, ANIC), 5 km N Leyburn at 27°58'S 151°38'E (1 ♀, QMB), Louie Creek 7 km S Lawn Hill (now Boodjamulla) National Park at 18°35'42"S 138°31'18"E (1 ♂, ANIC), Mornish (1 ♀, CAS), Mount Glorious at 27°20'S 152°45'E (3 ♀, MNKB), 48 km E Mount Surprise at 18°09.0'S 144°43.6'E (2 ♀, CAS), Mount Walsh National Park ca 7 km SE Biggenden (1 ♀, 1 ♂, ANIC), 3 km NE Mount Webb at 15°03'S 145°09'E (1 ♀, ANIC), Murrays Spring 8 km NW Musselbrook at 18°35'S 138°03'E (2 ♀, ANIC), Paluma Range National Park at 18°51.6'S 146°07.6'E (8 ♀, 9 ♂, CAS), 1 km S Roche Creek at 25°57'S 149°54'E (2 ♂, ANIC), 2 km N Rokeby at 13°39'S 142°40'E (1 ♀, ANIC), Sandstone Outcrops 30 km W Fairview (1 ♀, ANIC), near Somerset Dam 20 km S Kilcoy at 27°07.3'S 152°33.0'E (3 ♂, CAS), 6 km N Taroom at 25°36'S 149°46'E (1 ♀, QMB), Watalgan Range 35 mi. NNW Bundaberg (1 ♀, 1 ♂, ANIC), 13 km SE Weipa at 12°40'S 143°00'E (1 ♀, 1 ♂, ANIC). **South Australia:** Aldinga Sellick Beach Reserve (1 ♂, SAM), Brookfield Conservation Park at 34°19'S 139°30'E (1 ♂, ANIC), Fossil Creek 40 km NW Oodnadatta (1 ♀, SAM), Gawler National Park at 32°35.1'S 135°26.3'E (1 ♀, CAS) and 32°35.4'S 135°25.1'E (2 ♂, CAS), Mabel Creek Station (1 ♀, SAM), North Flinders Ranges 50 km SSW Balcanooona (1 ♀, SAM), Oraparinna Creek at Dingly Dell Camp at 31°21'S 138°42'E (1 ♀, 2 ♂, ANIC), Salisbury near Adelaide (1 ♀, SAM), 1.9 km SW Sentinel Hill at 26°05'33"S 132°26'05"E (1 ♀, SAM), Victory Well in Everard Ranges (1 ♀, SAM), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (1 ♀, AMNH; 14 ♀, 4 ♂, CAS), 3 km ENE Wilpena at 31°31.0'S 138°36.6'E (5 ♀, 16 ♂, CAS). **Victoria:** Lake Hattah (1 ♂, BMNH). **Western Australia:** Avon Valley in Walyunga National Park (1 ♀, WAM), 15 km NW Badja Homestead at 28°31'S 116°40'E (1 ♂, WAM), Cape Range National Park: Mandu Mandu Creek at 22°08'S 113°52'E (1 ♂, CAS), Charnley River 2 km SW Rolly Hill at 16°22'S 126°12'E (1 ♀, ANIC), 10 km W Cobra Station at 24°10.2'S 116°23.0'E (1 ♀, ANIC), 18 km ENE Comet Vale Siding at 29°57'S 121°07'E (1 ♂, WAM), Cottesloe at 31°59'35"S 115°45'25"E (2 ♀, WAM), Derby (1 ♀, CAS), Dongarra (1 ♀, BMNH), Eneabba at 29°49'29"S 115°15'40"E (1 ♀, WAM), François Peron National Park ca 10 km N Denham at 25°50.3'S 113°33.3'E (9 ♀, 18 ♂, CAS), Juna Downs Station at 22°51'30"S 118°40'14"E (1 ♂, AMS), Karijini National Park at 22°28.4'S 118°32.6'E (1 ♀, ANIC) and at 22°28.7'S 118°32.3'E (1 ♀, ANIC), Kennedy Range National Park at 24°38.7'S 115°10.7'E (1 ♀, CAS), Langi Crossing (1 ♀, CAS), 28 km E Leonora (1 ♀, CAS), 6 km ENE Merredin (1 ♀, WAM), Mount Augustus National Park at 24°21.7'S 116°50.2'E (1 ♀, CAS), Mount



Gibson Station (2 ♂, WAM), 2.5 km N Mount Linden at 29°19'S 122°25'E (1 ♂, WAM), Nedlands at 31°58'55"S 115°48'25"E (2 ♀, WAM), Perth: Darlington (1 ♀, 1 ♂, WAM), Stirling Range at 34°19'S 118°12'E (1 ♀, WAM), Walyunga National Park 35 mi. NE Perth (1 ♀, AMS), Yalgorup National Park at 32.839339°S 115.639100°E (1 ♀, 1 ♂, MNKB), Youanmi at 26°37'S 118°50'E (1 ♀, WAM), no specific locality (1 ♂, BMNH, lectotype of *Pison tibiale*).

***Pison tomentosum* Pulawski, species nova**

Figures 1123-1125.

**NAME DERIVATION.**— *Tomentosum*, Latin neuter adjective derived from *tomentum*, *pubescence composed of densely matted hairs*; with reference to the dense pilosity of this species (particularly on the propodeal dorsum).

**RECOGNITION.**— The female of *P. tomentosum* (the male is unknown) is characterized by the lower gena unsculptured and shiny on each side of the oral fossa, and the presence of psammophores on the lower gena (adjacent to the unsculptured area), mandible, forecoxa, and forefemur. The dense, appressed vestiture, completely concealing the sculpture on the mesopleuron and propodeal dorsum in fresh specimens, is unique among the Australian *Pison*.

**DESCRIPTION.**— Frons dull, finely punctate, punctures less than one diameter apart, middle supraantennal carina rudimentary or absent. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron impunctate anterolaterally. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, less than one diameter apart. Tegula slightly enlarged. Mesopleural punctures fine, nearly compressed against each other. Postspiracular carina present, about half as long to as long as midocellar diameter. Mesopleuron adjacent to metapleuron and propodeal side adjacent to metapleuron below dorsal pit with conspicuously foveolate sulcus. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate (punctures less than one diameter apart), without ridges; side punctate, punctures less than one diameter apart, interspaces merging into minute ridges; posterior surface punctate (punctures less than one diameter apart), with several minute, transverse ridges ventrally. Hindcoxal dorsum with outer margin obtusely carinate except sharply carinate basally. Punctures of tergum 1 minute and less than one diameter apart on horizontal part. Sterna densely punctate throughout except up to several diameters apart on apical depressions.



FIGURES 1123-1124. *Pison tomentosum* Pulawski, sp. nov., female. (1123) Clypeus and mandibles; (1124) Propodeal dorsum.

Setae silvery, appressed on thorax, propodeum, and tergum I, oriented mainly or exclusively ventrally on upper frons; completely concealing integument on clypeus, mesopleuron, and propodeal dorsum (Fig. 1124). Apical depressions of terga with silvery, setal fasciae.

Body all black.

♀.— Upper interocular distance equal to  $0.74\text{--}0.78 \times$  lower interocular distance; ocellocular distance equal to  $1.2\text{--}1.3 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.96 \times$  distance between eye notches. Free margin of clypeal lamella slightly arcuate, almost straight, forming obtuse corner on each side (Fig. 1123); distance between corners greater than between one corner and adjacent orbit. Dorsal length of flagellomere I  $2.1 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $1.1 \times$ ,  $1.0 \times$ , and  $0.8\text{--}0.9 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between hypostomal carina and psammophore. Mandible: trimmal carina with small incision shortly after midlength. Tergum VI broadly angulate. Length  $8.2\text{--}9.2$  mm; head width  $2.8$  mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1125).— Northern Territory, Queensland, southern part of South Australia.

**RECORDS.**— HOLOTYPE: ♀, AUSTRALIA: South Australia: Coopers Creek: ferry crossing, 30 Nov 1974, J.A. Herridge (SAM).

PARATYPES: AUSTRALIA: Northern Territory: 14 mi. S Kulgera, 15 Oct 1971, C.G. Roche (1 ♀, CAS). Queensland: Emerald, 31 Dec 1986, H. and A. Howden (1 ♀, ANIC). South Australia: Chowilla Game Reserve 24 air km N Renmark at  $34^{\circ}00.0'S$   $140^{\circ}49.4'E$ , 6 Dec 2010, V. Ahrens and W.J. Pulawski (2 ♀, CAS).



FIGURE 1125. Collecting localities of *Pison tomentosum* Pulawski, sp. nov.

### *Pison translucens* Pulawski, species nova

Figures 1126–1133.

**NAME DERIVATION.**— *Translucens*, Latin for *translucent*; with reference to the translucent apical lamella of male tergum VII.

**RECOGNITION.**— *Pison translucens* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, tegula partly impunctate and asetose, and setae appressed on tergum I. The gaster is all black (except tergum VII apically in the male), but the apical depressions of terga are brown and tergal setae are golden, forming golden fasciae on the apical depressions.

The female is mainly characterized by the absence of specializations found in other species: the clypeus is the usual shape, with a roundly arcuate lamella that is longer mesally than laterally, with a deeply concave free margin of the lateral clypeal section, and the surface not concave above the lamella, the ocellocular distance is  $0.9\text{--}1.0 \times$  hindocellar diameter, the gena is punctate and setose on each side of the oral fossa (setae sinuous, as long as  $1.5 \times$  midocellar diameter), the tegula is largely impunctate and asetose, the propodeum is ridged and punctate on the dorsum and has a carina separating dorsum and posterior surface from the side and extending from the gastral socket area toward the spiracle, and sterna II–IV are punctate throughout. It closely resembles



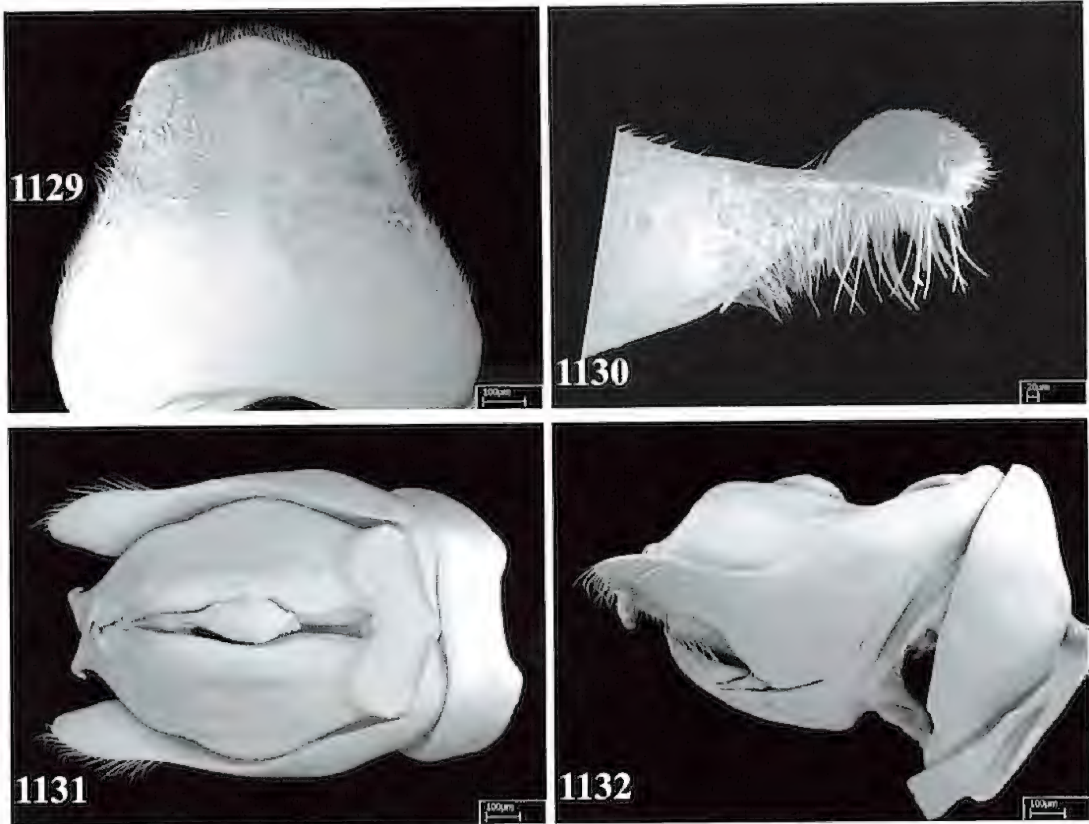


FIGURES 1126-1128. *Pison translucens* Pulawski, sp. nov. (1126) Female clypeus and mandibles; (1127) Male clypeus and mandibles; (1128) Male apical terga in dorsal view.

*P. angulare*, but differs from the latter in having at least the hindtibia ferruginous rather than black, and also a minimally narrower clypeal lamella (compare Figs. 1126 and 43). See also Sex Association section under *P. angulare*. Closely similar are also females of *P. decipiens* and *P. impressiventre* that can be recognized by the presence of a preapical tooth on the inner mandibular margin (tooth absent in *P. translucens*); also, the setae of the lower gena are curved apically in *P. decipiens*, while sinuous in *P. translucens*, and the ocellocular distance is  $0.9-1.1 \times$  midocellar diameter in *P. translucens*, but  $1.1-1.5$  in *P. impressiventre*.

The male is easily recognized by its translucent, medially narrowed lamella along the apical margin of tergum VII (Fig. 1128), in combination with the setae of lower gena sinuous, as long as  $1.0-1.2 \times$  midocellar diameter. The shape of sternum VIII is a useful subsidiary recognition feature (Fig. 1129). The male of *P. aridum* is similar, but differs in having the posterior margin of the black, sclerotized portion of tergum VII (adjacent to the yellowish portion) acutely angulate (Fig. 114), and the genal setae straight, shorter than midocellar diameter; also the shape of sternum VIII is different (compare Figs. 1129 and 115).

**DESCRIPTION.**—Frons dull, punctures of upper frons (above midfrontal carina) compressed against each other. Occipital carina joining hypostomal carina. Gena in female narrow in dorsal view. Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron closely punctate in most specimens, but punctures several diameters apart in outer half in some. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, interspaces linear. Tegula enlarged, extending slightly beyond anterior margin of axilla, its outer margin straight or slightly convex (except anteriorly and posteriorly). Mesopleural punctures less than one diameter apart. Postspiracular carina present but ill defined, varying from about half diameter to entire diameter of midocellus. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending



FIGURES 1129-1132. *Pison translucens* Pulawski, sp. nov., male. (1129) Sternum VIII (ventral surface); (1130) Sternum VIII in lateral view; (1131) Genitalia in dorsal view; (1132) Genitalia in lateral slightly oblique view.

from gastral socket area toward spiracle; dorsum with short transverse ridges emerging from middle carina, otherwise closely punctate, interspaces merging into irregular ridges; side finely, irregularly ridged, punctate between ridges; posterior surface ridged, punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures about one diameter apart. Hindcoxal dorsum with outer margin sharply carinate (except basally). Punctures of tergum I less than one diameter apart. Sterna punctate throughout.

Setae silvery on head and thorax except golden on scutum, also golden on propodeal dorsum and terga (forming conspicuous fasciae on apical depressions), golden or with golden tinge on upper frons; both appressed and erect on frons and scutum; appressed on tergum I; oriented laterally above dorsal end of midfrontal carina and oriented ventrally beneath midocellus, partially concealing integument on clypeus in female, completely so in male (except lamella); setae of lower gena sinuous, as long as  $1.0-1.2 \times$  midocellar diameter.

Head, thorax, propodeum, and gaster black (apex of tergum VII yellowish in male); mandible ferruginous except black basally and apically; apical depressions of terga brown. Femora in female all black or apex of hindfemur ferruginous; hindtibia ferruginous, also midtibia in many specimens and foretibia in some; tarsi all or largely black, all ferruginous in some specimens. In male forefemur black or ferruginous in apical third, midfemur black or ferruginous in apical half, hindfemur ferruginous (only apically so in some specimens); tibiae ferruginous or foretibia black; tarsi ferruginous.



♀.— Upper interocular distance equal to  $0.62\text{--}0.64 \times$  lower interocular distance; ocellocular distance equal to  $0.9\text{--}1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.82\text{--}0.87 \times$  distance between eye notches. Free margin of clypeal lamella obtusely arcuate, slightly more than in *P. angulare* (compare Figs. 1126 and 43). Dorsal length of flagellomere I  $2.2\text{--}2.4 \times$  apical width, of flagellomere IX  $1.0\text{--}1.1 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length  $9.5\text{--}11.3$  mm; head width  $3.0\text{--}3.5$  mm.

♂.— Upper interocular distance equal to  $0.90\text{--}0.96 \times$  lower interocular distance; ocellocular distance equal to  $1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5 \times$  hindocellar diameter; eye height equal to  $0.86\text{--}0.88 \times$  distance between eye notches. Middle clypeal lobe markedly convex ventrally, base of lamella markedly below main clypeal surface; free margin of lamella sharply angulate. Dorsal length of flagellomere I  $1.9\text{--}2.0 \times$  apical width, of flagellomere X  $0.9\text{--}1.0 \times$  apical width. Tergum VII with translucent, medially narrowed lamella along apical margin, posterior margin of black, sclerotized portion of tergum (adjacent to lamella) broadly, obtusely tridentate (Fig. 1128). Apical margin of sternum VII broadly, shallowly concave; sternum VIII with impunctate, glabrous swelling basomedially, its apical margin slightly convex medially and slightly concave laterally; apicolateral arm broadly, obtusely angulate (Fig. 1129); lateral view: Fig. 1130. Genitalia: Figs. 1131, 1132. Length  $8.8\text{--}11.6$  mm; head width  $2.9\text{--}3.3$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1133).—

All Australia except Tasmania and Victoria.

**RECORDS.**— **HOLOTYPE:** ♂, **AUSTRALIA:** **South Australia:** Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , 22 Dec 2010, V. Ahrens and W.J. Pulawski (SAM).

**PARATYPES:** **AUSTRALIA:** **New South Wales:** 13 mi. N Broken Hill, 3 Apr 1963, K. Dansie (2 ♀, 1 ♂, SAM); 17 km NE Broken Hill at  $31^{\circ}47'S$   $141^{\circ}31'E$ , J. Carpenter and A. Davidson (1 ♂, AMN); Coleambally Irrigation Area at  $34^{\circ}56'10"S$   $145^{\circ}46'51"E$ , 14 Dec 1998, L. Wilkie and S. Pride (1 ♂, AMS); 1 km W Eumungerie at  $31^{\circ}56.7'S$   $148^{\circ}36.9'E$ , 15, 19, and 20 Dec 2009, V. Ahrens and W.J. Pulawski (3 ♂, CAS); Fowlers Gap Research Station at  $31^{\circ}05'S$   $141^{\circ}42'E$ , 29 Nov – 2 Dec 1981, I.D. Naumann and J.C. Cardale (4 ♀, 2 ♂, ANIC); Menindee, 2 Dec 1992, N.W. Rodd (1 ♀, AMS); Springs Creek 68 km SW Wilcannia at  $31^{\circ}44'S$   $142^{\circ}41'E$ , 29 Nov 1981, J.C. Cardale and I.D. Naumann (1 ♀, 1 ♂, ANIC); Warrensburg National Park, 20 Dec 1987, M.E. Irwin (1 ♀, UCD); 87 km E Wilcannia at  $31^{\circ}42.8'S$   $144^{\circ}08.6'E$ , V. Ahrens and W.J. Pulawski, 21 Dec 2011 (10 ♀, 61 ♂, CAS) and 23 Dec 2011 (18 ♀, 65 ♂, CAS; 1 ♀, 1 ♂, NHMW); Warrumbungle National Park at  $31^{\circ}16'S$   $148^{\circ}57'E$ , 17 Dec 1995, M.E. Irwin (1 ♀, 1 ♂, MNKB). **Northern Territory:** 30 km WNW Alice Springs at  $23^{\circ}32'S$   $133^{\circ}38'E$ , 7 Oct 1978, J.C. Cardale (2 ♂, ANIC); 32 km WNW Alice Springs at  $23^{\circ}36'S$   $133^{\circ}35'E$ , 8 Oct 1978, J.C. Cardale (6 ♂, ANIC); Trephina Gorge Nature Park at John Hayes Rockhole at  $23^{\circ}32'S$   $134^{\circ}21'E$ , 10 Apr 1981, M. Malipatil and J. Hawkins (1 ♂, NTM); Trephina Gorge Nature Park at Waterhouse Range 39 km SSW Alice Springs at  $23^{\circ}59'S$   $133^{\circ}38'E$ , 11 Oct 1978, J.C. Cardale (2 ♂, ANIC); West McDonnell National Park ca 3 km W road to Simpson Gap at  $23^{\circ}41.8'S$   $133^{\circ}41.7'E$ , 27 Jan – 27 Feb 2008, Ch.M. Palmer (1 ♂, NTM). **Queensland:** Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$ , 16 Aug – 13 Sept 1993, P. Zborowski and S. Shattuck (1 ♀, ANIC) and 17 Dec 1993 – 13 Jan 1994, P. Zborowski and E.D. Edwards (1 ♀, ANIC); Hann River at  $15^{\circ}11'S$   $143^{\circ}52'E$ , 20 Mar – 24 Apr 1994, P. Zborowski and G. Turner (1 ♀, ANIC); 48 km E Mount Surprise at  $18^{\circ}09.0'S$   $144^{\circ}43.6'E$ , V. Ahrens and W.J. Pulawski, 21 Nov 2012 (1 ♀, 12 ♂, CAS), 22 Nov 2012 (3 ♀, 16 ♂, CAS); 9 km NW Mount Tozer at  $12^{\circ}44'S$   $143^{\circ}08'E$ , 30 June – 7 July 1986, J.C. Cardale (1 ♀, ANIC); 2 km N Rokeby, 17 Dec



FIGURE 1133. Collecting localities of *Pison translucens* Pulawski, sp. nov.

1993 – 17 Jan 1994 (1 ♀, ANIC); Split Rock at 15°39'S 144°31'E, 27 Apr – 28 May 1993, P. Zborowski and A. Roach (1 ♀, ANIC), and 28 May – 26 June 1993, P. Zborowski and I.D. Naumann (1 ♀, ANIC). **South Australia:** Calperum Station 16 km N Renmark at 34°02.9'S 140°42.2'E, 4 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Calperum Station 79 km N Renmark at 33°31'S 140°24'E, 11 Oct – 9 Nov 1995, K. Pullen (1 ♀, ANIC); 8 km E Ceduna at 32°07.8'S 133°46.0'E, 8 Jan 2011, V. Ahrens and W.J. Pulawski (2 ♀, 1 ♂, CAS); Chowilla Game Reserve 24 air km N Renmark at 33°58.0'S 140°48.8'E, 5 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♂, CAS); 43 km NNE Cowell at 33°20'S 137°06'E, 28 Nov 1992, I.D. Naumann and J.C. Cardale (1 ♂, ANIC); Dingly Dell Camp on Oraparina Creek at 31°21'S 138°42'E, I.D. Naumann and J.C. Cardale (4 ♂, ANIC), 4–10 Nov 1987 (3 ♂, ANIC), and 7 Nov 1987 (4 ♂, ANIC); Gawler National Park at 32°35.1'S 135°26.3'E, V. Ahrens and W.J. Pulawski, 5 Jan 2011 (1 ♀, 11 ♂, CAS) and 7 Jan 2011 (1 ♀, 2 ♂, CAS); Gawler National Park at 32°35.4'S 135°21.1'E, 7 Jan 2011, V. Ahrens and W.J. Pulawski (2 ♀, 10 ♂, CAS); 28 km S Gladstone, 11 Jan 1982, R.W. Thorp (1 ♀, UCD); 9.7 km N Hawker, 1 Mar 1972, E. Matthews (1 ♀, SAM); 10 km NNW Penong at 31°50.3'S 132°57.9'E, V. Ahrens and W.J. Pulawski, 16 Jan 2011 (5 ♀, 2 ♂, CAS) and 18 Jan 2011 (6 ♀, 7 ♂, CAS); Port Clinton Conservation Park at 34°09.4'S 138°03.2'E, 14 Dec 2010 (1 ♀, 4 ♂, CAS) and 16 Dec 2010 (2 ♀, 6 ♂, CAS), V. Ahrens and W.J. Pulawski; 19 km N Renmark at 34°00'S 140°47'E, R. K. Pullen, 10 Oct – 9 Nov 1995 (1 ♂, ANIC) and 8 Nov – 4 Dec 1995 (1 ♀, ANIC); Sheoak Hill Conservation Reserve 38 km NNW Coville at 33°22.6'S 136°47.4'E, 29 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♀, 6 ♂, CAS); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, V. Ahrens and W.J. Pulawski, 21 Dec 2010 (1 ♀, 1 ♂, CAS), 22 Dec 2010 (2 ♀, 8 ♂, CAS), 23 Dec 2010 (2 ♂, CAS), 27 Jan 2011 (1 ♀, 5 ♂, CAS), and 28 Jan 1011 (1 ♂, CAS); 3 km ENE Wilpena at 31°31.0'E 138°36.6'E, V. Ahrens and W.J. Pulawski, 23 Dec 2010 (2 ♂, CAS), 26 Jan 2011 (1 ♀, 2 ♂, CAS) and 27 Jan 2011 (2 ♀, 7 ♂, CAS); 34 km S Wilpena, 4 Jan 1980, R.M. Bohart (1 ♀, 13 ♂, UCD); Wirreanda Creek 28 km SW Hawker at 32°05.9'S 138°17.7'E, 26 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♂, CAS). **Western Australia:** 55 km N Esperance, 25 Nov 1979, R.M. Bohart (1 ♀, UCD); Ethel Creek at 22°54'S 120°10'E, 28 Nov 1971, N.S. Expedition IV (2 ♂, WAM); 12 km NE Giles in Rawlinson Range at 25°02'S 128°18'E, 14 Jan 1990, T.F. Houston (1 ♀, WAM); Irrunytju Rockhole in Hinckley Range at 26°07'S 128°58'E, 19–21 Jan 1990, T.F. Houston and M.S. Harvey (1 ♂, WAM); Kathleen Valley, 1963, T. Moriarty (1 ♀, WAM); Karijini National Park at 22°30.1'S 118°24.4'E, 21–23 May 2003, M.E. Irwin and F.D. Parker (1 ♂, CAS); 28 mi. E Leonora, 18 Sept 1962, E.S. Ross and D.Q. Cavagnaro (3 ♀, 19 ♂, CAS); Mount Gibson Station, 26 Feb 2000, S.R. Patterson (1 ♂, WAM); Nanutarra - Wittenoom road 25 km NE railway crossing at 22°21'21"S 117°54'16"E, 16–20 Feb 2005, M. Bulbert and S. Ginn (1 ♀, AMS); 158 km S Newman (= 9 km N Kumarina Roadhouse) at 24°37.8'S 119°36.8'E, 18–21 May 2003, M.E. Irwin and D.D. Parker (1 ♂, CAS); Thomas River 23 km WNW Mount Arid at 33°51'S 123°00'E, 4–7 Nov 1977, M.S. Upton (1 ♂, ANIC); Youanmi at 28°37'S 118°50'E, 13 Oct 1974, A.M. and M.J. Douglas (2 ♂, WAM); Yundamindra Homestead at 29°15'S 122°06'E, 16 Mar 1979, T.F. Houston (2 ♂, WAM).

### *Pison trichops* Pulawski, species nova

Figures 1134–1136.

**NAME DERIVATION.**— From the Greek words *τριχ* (genitive: *τριχος*), a *hair*, and *οφ*, an *eye*, a noun in apposition to the generic name; with reference to the setose eye of this species.

**RECOGNITION.**— The densely setose eye of this species (Fig. 1134) is unique among the Australian *Pison*. The eye is also setose in *P. deplanatum*, but only above the eye emargination, and the setae are sparser. The finely punctate throughout tegula and the presence of only two submarginal cells are subsidiary recognition features.

**RELATIONSHIP TO *PISON AGILE* SPECIES GROUP.**— The densely setose eye and the presence of only two submarginal cells place this species in the *P. agile* species group of Menke (1988). The species, however, differs significantly from the other members of the *P. agile* group as described by Antropov (1994) by three characters: the antenna is not clavate, the propodeum has a longitudinal carina that extends from the gastral socket area toward the spiracle, and the midtibial spur is not thickened. Also, the subomaulus is poorly developed or absent and, unlike most members of





FIGURES 1134-1135. *Pison trichops* Pulawski, sp. nov., female. (1134) Head in frontal view; (1135) Lower part of head in frontal view showing clypeus.

the *P. agile* group, the metapleuron flange is not expanded. It is therefore possible that *P. trichops* is not really related to the species of the *P. agile* group and the setose eye may be an independently acquired feature.

**DESCRIPTION.**—Frons dull, minutely punctate, punctures contiguous, middle supraantennal carina absent. Midocellus smaller than hindocellus. Distance between antennal socket and orbit slightly smaller than socket width. Eye covered with short, erect, dense setae (Fig. 1134). Labrum emarginate. Anteromedian pronotal pit absent. Scutum foveate along flange (at least slightly so), with or without short longitudinal ridges adjacent to posterior margin; scutal punctures minute, contiguous. Scutellum with foveate sulcus along foremargin. Tegula enlarged, finely punctate throughout, fully concealing humeral plate. Mesopleural punctures fine to minute, less than one diameter apart; poorly developed subomaulus present in specimen from Western Australia and a vestigial one in one specimen from Gregory National Park. Postspiracular carina absent. Metapleural sulcus impressed between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum transversely ridged, punctate between ridges; side slightly concave, ridged and punctate to nearly all punctate; posterior surface ridged, punctate between ridges. Forewing with two submarginal cells, posterior margin of second one equal to  $1.0\text{--}1.2 \times$  its height. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of hindtibia with a few evanescent spines. Punctures of tergum I minute, contiguous to about one diameter apart. Sterna finely punctate throughout.

Setae silvery, strictly appressed on frons, gena, thorax, and tergum I; frontal setae oriented dorsally in dorsal half; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black; clypeus next to free margin of lamella and pronotal lobe yellowish brown in specimen from Western Australia; mandible black basally, yellowish reddish mesally, brown apically; antenna black in specimens from Queensland and South Australia, flagellum yellowish brown ventrally in those from Northern Territory, in female from Western Australia the following is ferruginous: scape and pedicel ventrally, and flagellum largely (basal flagellomeres slightly darkened dorsally, apical flagellomeres largely so). Femora black, tibiae and tarsi black except in female from Western Australia which has the following: trochanters yellowish brown, femora black, foretibia yellowish brown except narrowly black on outer surface, midtibia yellowish brown except brown dorsally and posteriorly, hindtibia brown except yellowish

brown basally, foretarsus yellowish, mid- and hindtarsi brown except basitarsus yellowish basally. Mid- and hindtibial spurs whitish.

♀.— Upper interocular distance equal to  $1.13\text{--}1.20 \times$  lower interocular distance; ocellocular distance equal to  $0.6\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.7\text{--}1.8 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}0.98 \times$  distance between eye notches. Free margin of clypeal lamella obtusely tridentate in most specimens (Fig. 1135), but truncate in female from Western Australia. Dorsal length of flagellomere I  $1.0 \times$  apical width, of flagellomere IX  $0.9 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Length 3.9–4.3 mm; head width 1.0–1.2 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1136).— Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA:** **Queensland:** circa 35 km SW Moura at  $24^{\circ}48'S$   $149^{\circ}46'E$ , 22 Oct 1992, P. Macnicol (ANIC).

**PARATYPES:** **AUSTRALIA:** **Northern Territory:** Gregory National Park at  $15^{\circ}36'43"S$   $130^{\circ}24'08"E$ , M.E. Irwin, F.D. Parker, and C. Lambkin, 6–12 June 2001 (1 ♀, ANIC; 2 ♀, CAS) and 15–18 June 2001 (1 ♀, ANIC). **Queensland:** Crediton State Forest at  $21^{\circ}11.8'S$   $148^{\circ}29.9'E$ , 1 Nov 2006, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Murrays Spring 8 km NW Musselbrook at  $18^{\circ}35'S$   $138^{\circ}03'E$ , 9–20 May 1995 (1 ♀, ANIC). **South Australia:** Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , 22 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♀, CAS). **Western Australia:** Yandi-coogina Creek 30 km E Marble Creek at  $21^{\circ}11.0'S$   $120^{\circ}01.7'E$ , 2–14 May 2003, M.E. Irwin and F.D. Parker (1 ♀, CAS).



FIGURE 1136. Collecting localities of *Pison trichops* Pulawski, sp. nov.

### *Pison tridentatum* Pulawski, species nova

Figures 1137–1148.

**NAME DERIVATION.**— *Tridentatum*, Latin neuter adjective meaning *tridentate*; with reference to the apically tridentate female mandible.

**RECOGNITION.**— *Pison tridentatum* is an all black species with the setae silvery, three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I.

The female has a psammophore on the gena, mandible, and forefemoral venter, and the lower gena impunctate and asetose on each side of the oral fossa (between the fossa and the psammophore). Other species are similar, but *P. tridentatum* and *P. dentatum* are unique in having two conspicuous preapical teeth on the inner mandibular margin apically rather than simple. Unlike *P. dentatum*, most of the tegula is impunctate in *P. tridentatum*, while mostly punctate in *P. dentatum*. Additionally, the ocellocular distance of *P. tridentatum* is smaller than the interocellar area, the clypeal lamella is rounded laterally, not forming a corner, the propodeum has a longitudinal carina separating the side from the dorsum and the posterior surface, and sterna II and III are impunctate apicomeresally. Also similar is *P. setiferum*, which differs in having a simple mandibular apex, the setae of the upper frons and of interocellar area appressed, as long as  $0.2\text{--}0.3 \times$  midocellar diameter (rather than erect or suberect, as long as  $0.4\text{--}0.6 \times$  midocellar diameter), and the





FIGURES 1137-1142. *Pison tridentatum* Pulawski, sp. nov. (1137) Female clypeus and mandibles; (1138) Male clypeus and mandibles; (1139) Female gena in lateral oblique view (arrow shows occipital carina); (1140) Genal psammophore of female; (1141) Forefemoral psammophore of female; (1142) Female midfemur showing cect ventral setae.

longest setae of the genal and forefemoral psammophores, respectively, about  $0.4-0.6 \times$  and  $0.3-0.5 \times$  the greatest forefemoral width (rather than  $0.5-1.0 \times$  and  $0.6-0.8 \times$ ).

The male shares with *P. dentatum* the free margin of the clypeal lamella obtusely angulate or rounded, not acutely angulate, and the mandible bidentate apically. Unlike *P. dentatum*, most of the tegula is impunctate in *P. tridentatum* (most of tegula punctate in *P. dentatum*), and sternum VIII is at most minimally emarginate apically, rounded apicolaterally (in *P. dentatum* sternum VIII is emarginate apically, with angulate apicolateral corner). The presence of a well-defined abductor ridge is a subsidiary recognition feature, as is sternum VIII punctate and setose only near the apex; also, in some specimens the occipital carina is expanded ventrally (higher than the hypostomal carina).

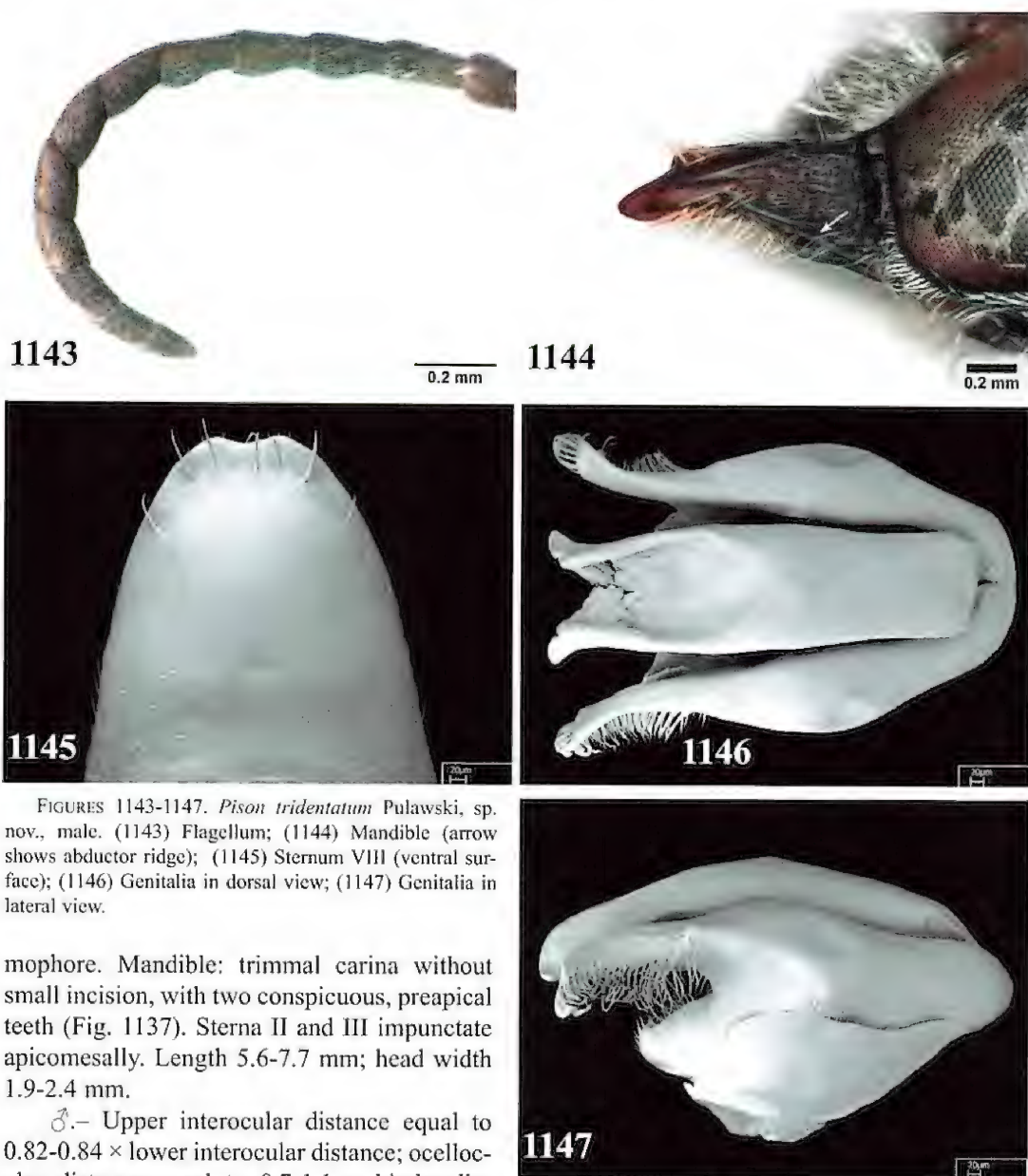
**DESCRIPTION.**—Frons dull, with shallow but well-defined punctures less than one diameter apart. Occipital carina joining hypostomal carina, expanded ventrally in some specimens. Female gena narrow in dorsal view. Mandible with well-defined abductor ridge (Fig. 1144). Labrum minimally emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Propleuron varying: either densely punctate throughout or largely with sparse punctures. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures small but well defined, nearly compressed in most specimens, but with small interspaces (less than one puncture width) in some small males; interspaces unsculptured. Tegula slightly enlarged. Mesopleural punctures well defined, compressed against each other in most specimens, up to one diameter apart in some. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus in many specimens costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina inconspicuous in specimen from Martins Well, Western Australia); dorsum irregularly rugose with tendency to form oblique ridges, punctate between rugae, with middle carina in shallow sulcus; side ridged, punctate between ridges; posterior surface conspicuously transversely ridged, punctate between ridges. Tergum I with small but well-defined punctures that vary from less than one diameter apart to slightly more than one diameter apart. Sternum II with punctures that vary from minute to conspicuous and from less than one diameter apart (some males) to several diameters apart mesally.

Setae silvery, appressed on frons (oriented dorsolaterally or dorsally in upper half, oriented laterally and ventrally in lower half); suberect on scutum but not longer than half midocellar diameter; mostly sinuous on lower gena (but straight, curved apically in smallest males), as long as  $2.5 \times$  midocellar diameter in female, as  $1.0-1.5 \times$  midocellar diameter in male; appressed on tergum I; nearly completely concealing integument on clypeus (except lamella) in female, completely so in male. Apical depressions of terga I-IV with silvery, setal fasciae.

Head, thorax, propodeum, legs, and gaster black; mandible varying from all black to yellowish brown mesally; male flagellum partly yellowish brown in some specimens.

♀.—Upper interocular distance equal to  $0.66-0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.7-0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1-1.3 \times$  hindocellar diameter; eye height equal to  $0.90-0.94 \times$  distance between eye notches. Free margin of clypeal lamella evenly rounded, with ill-defined corner, corners closer to each other than to respective orbit (Fig. 1137). Dorsal length of flagellomere I  $2.2-2.7 \times$  apical width, of flagellomere IX  $1.3-1.5 \times$  apical width. Lower gena, mandibular posterior margin, propleural and forecoxal outer margins, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.5-1.0 \times$ ,  $0.8-1.0 \times$ , and  $0.6-0.8 \times$ , respectively, of greatest forefemoral width); longest setae of midfemoral venter varying from  $0.5 \times$  midocellar diameter to  $1.0 \times$  midocellar diameter. Lower gena impunctate and asetose between oral fossa and psam-





FIGURES 1143-1147. *Pison tridentatum* Pulawski, sp. nov., male. (1143) Flagellum; (1144) Mandible (arrow shows abductor ridge); (1145) Sternum VIII (ventral surface); (1146) Genitalia in dorsal view; (1147) Genitalia in lateral view.

mophore. Mandible: trimmal carina without small incision, with two conspicuous, preapical teeth (Fig. 1137). Sterna II and III impunctate apicomesally. Length 5.6-7.7 mm; head width 1.9-2.4 mm.

♂.— Upper interocular distance equal to  $0.82-0.84 \times$  lower interocular distance; ocellocular distance equal to  $0.7-1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.7 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate or rounded (Fig. 1138). Flagellomeres IV-VI (except in smallest specimens) slightly convex ventrally (Fig. 1143), conspicuously convex in specimen from Martins Well. Dorsal length of flagellomere I  $1.6-1.9 \times$  apical width, of flagellomere X  $0.9-1.0 \times$  apical width. Mandible bidentate apically (Fig. 1136). Sternum VIII rounded to emarginate apically (Fig. 1145). Genitalia: Figs. 1146, 1147. Length 4.6-5.8 mm; head width 1.4-1.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1148).— Northern Territory, Queensland, South Australia, Western Australia

**RECORDS.—HOLOTYPE:** ♂, **AUSTRALIA: Northern Territory:** Keep River National Park at 15°57'55"S 129°01'52"E, 3-8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

**PARATYPES:** **AUSTRALIA: Northern Territory:** 12-17 mi. E Alice Springs, 22-27 Sept 1972, H.E. Evans (1 ♀, 1 ♂, ANIC); Buchanan Highway 31 km SSE Victoria Highway, 18-19 June, M.E. Irwin and F.D. Parker (1 ♂, CAS); Gregory National Park at 16°06.6'S 130°25.7'E, 24 May – 4 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC), at 16°06'35"S 130°25'39"E, 24 May – 4 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), at 16°06.7'S 130°25.4'E, 5-12 June 2001, T. Weir, K. Pullen, and P. Bouchard (2 ♂, CAS), at 16°06'47"S 130°25'24"E, 24 May – 4 June 2001,



FIGURE 1148. Collecting localities of *Pison tridentatum* Pulawski, sp. nov.

M.E. Irwin, F.D. Parker, and C. Lambkin (4 ♂, ANIC; 2 ♀, 1 ♂; CAS), at 16°09.8'S 130°26.5'E, 5-12 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC), and at 16°09'45"S 130°26'31"E, 12-15 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC); Keep River National Park at 15°45'44"S 129°05'55"E, M.E. Irwin and F.D. Parker, 8 June 2001 (1 ♀, 1 ♂, ANIC; 1 ♂, CAS), 9 June 2001 (2 ♀, 1 ♂, ANIC), 10-20 June 2001 (1 ♂, CAS), at 15°45.4'S 129°05.6'E, 8 June 2001, F.D. Parker and M.E. Irwin (2 ♂, CAS), at 15°47'49"S 129°06'31"E, 31 May – 3 June 2001, T. Weir, K. Pullen, and P. Bouchard (1 ♀, CAS), and 3-6 June 2001, C. Lambkin F.D. Parker, and M.E. Irwin (1 ♀, 1 ♂, CAS), at 15°54'55"S 129°04'11"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 1-3 June 2001 (1 ♂, ANIC), and 3-8 June 2001 (1 ♂, ANIC; 1 ♀, CAS), at 15°55'22"S 129°03'25"E, 3-6 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS), at 15°57'33"S 129°01'44"E, 3-8 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, ANIC), at 15°57'55"S 129°01'52"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 3-8 June 2001 (1 ♀, CAS), 10-13 June 2001 (2 ♀, 1 ♂, CAS), and 13-20 June 2001 (1 ♀, CAS); Koongarra 15 km E Mount Cahill at 12°52'S 132°50'E, 12-13 June 1973, J.C. Cardale (1 ♀, ANIC); Victoria Highway at 15°42'40"S 130°07'48"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 6-13 June 2001 (1 ♀, CAS), 13-19 June 2001 (1 ♂, CAS), and 16°03'22"S 129°05'15"E, 15-19 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS); Virginia 31 km SE Darwin Central Business District at 12°33'S 131°02'E, 16 Aug 1998, S.M. Gregg (1 ♂, NTM). **Queensland:** 7 km S Batavia Downs at 12°43'S 142°42'E, 19 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC); Cockatoo Creek at 11°39'S 142°27'E, 12 Aug – 10 Sept 1993, P. Zborowski and S. Shattuck (1 ♀, ANIC); Cockatoo Creek Crossing 17 km NW Heathlands at 11°39'S 142°27'E, 7 June – 25 July 1992, P. Zborowski and E. Nielsen (3 ♀, 2 ♂, ANIC), 25 July – 19 Aug 1992, P. Zborowski and J.C. Cardale (1 ♀, ANIC), and 19 Aug – 18 Sept 1992, P. Zborowski and L. Miller (1 ♀, 1 ♂, CAS); Coen at 13°57'S 143°12'E, 16 Aug – 30 Sept 1993, P. Zborowski and A.S. Shattuck (1 ♂, ANIC) and 13 Sept – 20 Oct 1993, P. Zborowski and D. Rentz (1 ♀, ANIC); 30 km S Cooktown at 15°40.9'S 145°12.4'E, 13 May 2007, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Hann River at 15°11'S 143°52'E, 17 Aug – 15 Sept 1993, P. Zborowski and S. Shattuck (1 ♀, ANIC); Holts Creek 8 km N Musselbrook Camp at 18°33'S 138°11'E, I.D. Naumann (1 ♀, CAS); Musselbrook Camp at 18°36'S 138°08'E, 8-21 May 1995, I.D. Naumann (2 ♂, ANIC); Ridgepole Waterhole 24 km ESE Musselbrook Camp at 18°40'S 138°20'E, 19 May 1995, I.D. Naumann (1 ♂, ANIC); 13 km SE Weipa at 12°40'S 143°00'E, 15 Aug – 12 Sept 1995, P. Zborowski and S. Shattuck (1 ♀, ANIC). **South Australia:** Brookfield Conservation Park at 34°19'S 139°30'E, 2 Dec 1991 – 2 Jan 1992, J. Stelman and S. Williams (1 ♀, ANIC); 19 km N Renmark at 34°00'S 140°47'E, 24 Jan – 20 Feb 1996, K.R. Pullen (1 ♀, ANIC; 1 ♀, CAS). **Western Australia:** Carson escarpment at 14°49'S 126°49'E, 9-15 Aug 1975, I.F.B. Common and M.S. Upton (1 ♀, ANIC; 1 ♀, CAS); Drysdale River at 15°02'S 126°55'E, 3-8 Aug 1975, I.F.B. Common and M.S. Upton (2 ♀, ANIC; 1 ♀, CAS); Karijini National Park at 22°26.3'S 118°22.9'E, 23 Apr – 4 May 2003, M.E. Irwin and F.D. Parker (2 ♀, CAS), 22°28.8'S 118°21.6'E, 21 Apr 2003, F.D. Parker and M.E. Irwin (1 ♀, ANIC), and 22°28.4'S 118°32.6'E, 23 Apr – 4 May 2003, M.E. Irwin and F.D. Parker (1 ♀, CAS); Lennard River crossing at 17°23'S 124°44'E, 14-28 July 1988, T.F. Houston (2 ♂, WAM); Lone Dingo 9 km



SW Warrender Hill at 14°35'30"S 125°45'40"E, Aug 1987, C. Kemper (1 ♂, SAM); Martins Well at 16°34'S 122°51'E, 29 Apr 1977, D.H. Colless (1 ♂, ANIC); Mount Augustus National Park at 24°18.0'S 116°47.6'E, 25 Apr – 7 May 2003, M.E. Irwin and F.D. Parker (1 ♀, CAS); 47 km S Pardoo Roadhouse at 20°22.7'S 120°01.3'E, 1–14 May 2003, M.E. Irwin and F.D. Parker (3 ♂, CAS); Synnot Creek at 16°31'S 125°18'E, 17–20 June 1988, T.A. Weir (1 ♂, ANIC).

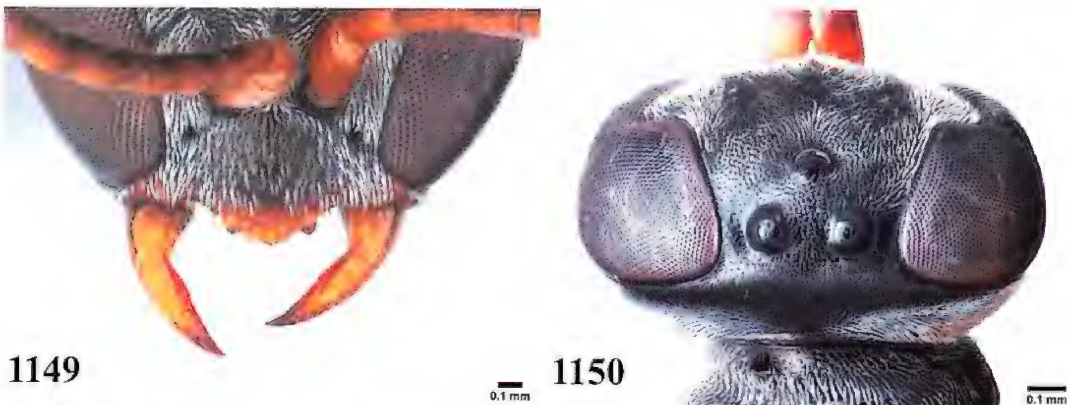
***Pison trilobatum* Pulawski, species nova**

Figures 1149–1151.

**NAME DERIVATION.**— The name *trilobatum* derives from the Latin prefix *tri-*, meaning *three*, and the adjective *lobatus* (neuter: *lobatum*), meaning *having lobes*, *lobate*; with reference to the trilobate clypeal lamella of this species female.

**RECOGNITION.**— *Pison trilobatum* has only two submarginal cells, an entirely, finely punctate tegula, and, in the female (the male is unknown), the dorsal length of flagellomere II is  $2.4 \times$  its apical width. *Pison incurvatum* and *P. bicellulare* are similar, but in *P. trilobatum* the legs are ferruginous (rather than black), the clypeal lamella is distinctly trilobate (Fig. 1149), not bent posterad (only slightly trilobate in *bicellulare*, evenly arcuate and bent posterad in *P. incurvatum*).

**DESCRIPTION.**— Frons dull, minutely punctate, punctures almost contiguous. Distance between antennal socket and orbit slightly smaller than socket width. Gena narrow in dorsal view (Fig. 1150). Labrum not emarginate. Anteromedian pronotal pit rounded, slightly transversely elongate, slightly shorter than midocellar diameter. Scutum slightly foveate along flange, with short, evanescent longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Scutellum with foveate sulcus along anterior margin. Tegula enlarged. Mesopleural punctures fine, about one diameter apart. Postspiracular carina present, about half as long as midocellar diameter. Metapleuron microscopically punctate; metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely (almost transversely) ridged; side finely ridged, punctate between ridges (impunctate anteriorly), punctures mostly more than one diameter apart, but less than that posteriorly; posterior surface transversely ridged, punctate between ridges. Forewing with two submarginal cells; posterior margin of second submarginal cell equal to  $1.1 \times$  its height. Hindcoxa dorsum with outer margin obtusely carinate. Outer surface of hindtibia with evanescent spines. Punctures of tergum I minute, averaging slightly more than one diameter apart on horizontal portion. Sterna minutely punctate throughout.



FIGURES 1149–1150. *Pison trilobatum* Pulawski, sp. nov., female. (1149) Clypeus and mandibles; (1150) Head in dorsal view.

Setae silvery, appressed on frons, postocellar area, gena, scutum, and tergum I; not concealing integument on clypeus. Apical depressions of terga I and II with inconspicuous, silvery, setal fasciae; following terga with evanescent fasciae.

Head, thorax, propodeum, and gaster black, lamella of female clypeus and adjacent portion of clypeus proper ferruginous; mandible yellowish (brown at very apex); labrum yellow; antenna ferruginous ventrally, black dorsally. Trochanters, femora, tibiae, and tarsi ferruginous; mid- and hindtibial spurs whitish.

♀.—Upper interocular distance equal to  $1.0 \times$  lower interocular distance; ocellocular distance equal to  $0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella distinctly trilobate, median lobe widest (Fig. 1149). Dorsal length of flagellomere I  $2.4 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Mandible: trimmal carina with minuscule incision at about apical two thirds of length. Length 4.3 mm; head width 1.0 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** Fig. 1151).—Known from two closely adjacent localities in Western Australia.

**RECORDS.**—HOLOTYPE: ♀, AUSTRALIA: **Western Australia:** Karijini National Park at  $22^{\circ}25.6'S$   $118^{\circ}23.7'E$ , 23 Apr – 4 May 2003, F.D. Parker and M.E. Irwin (ANIC).

PARATYPE: AUSTRALIA: **Western Australia:** Karijini National Park at  $22^{\circ}26.3'S$   $118^{\circ}22.9'E$ , 23 Apr – 4 May 2003, F.D. Parker and M.E. Irwin (1 ♀, CAS).



FIGURE 1151. Collecting localities of *Pison trilobatum* Pulawski, sp. nov.

### *Pison triodon* Pulawski, species nova

Figures 1152–1158.

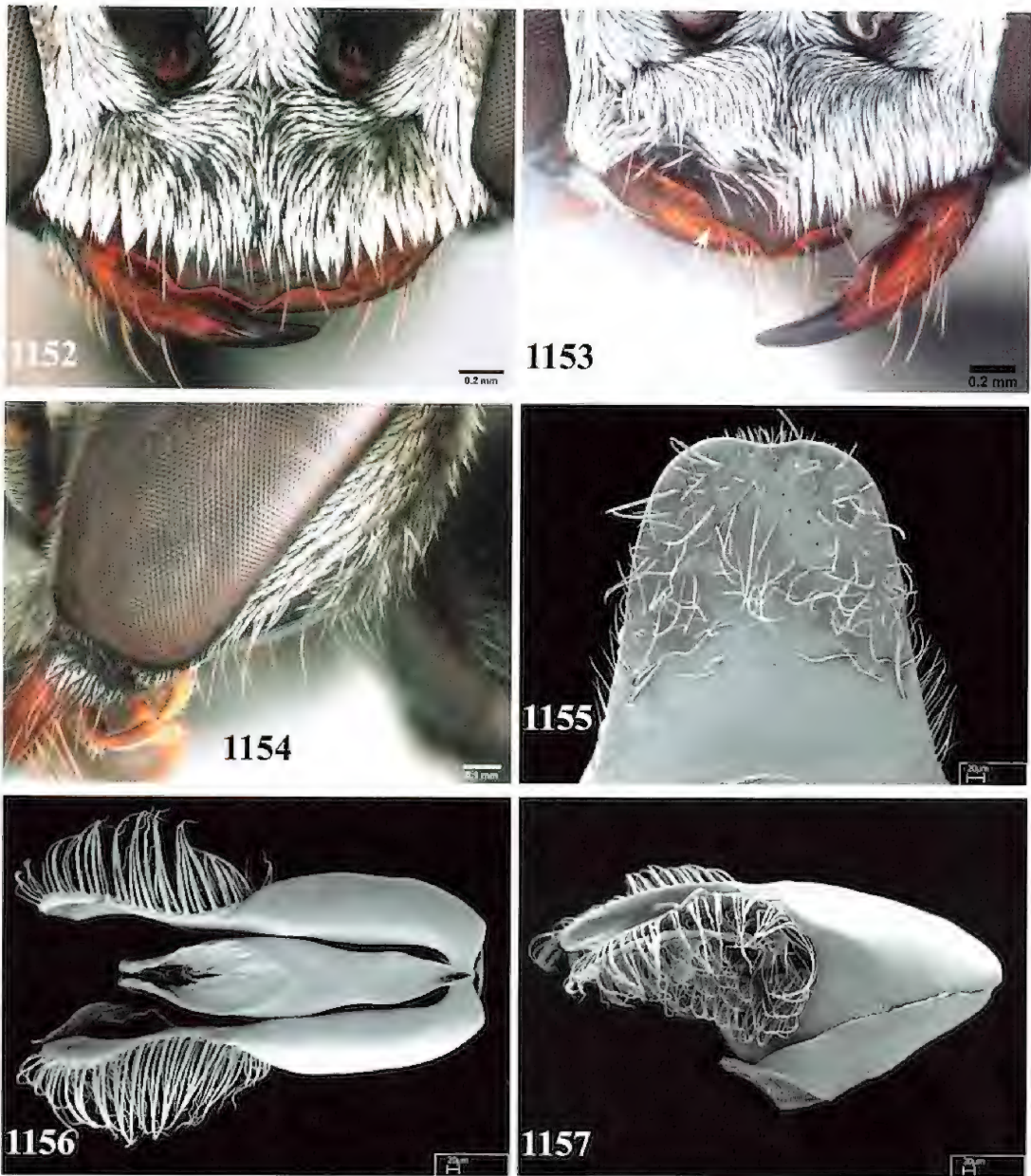
**NAME DERIVATION.**—*Triodon* is derived from two Greek words:  $\tauρία$ , *three*, and  $\deltaούς$ , a *tooth*; with reference to the tridentate female clypeus of this species.

**RECOGNITION.**—*Pison triodon* is an all black species (mandible ferruginous except basally and apically, flagellum brown to yellowish brown ventrally, apical tarsomere brown or ferruginous), with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, and setae silvery, appressed on tergum I.

The female is characterized by the lower gena impunctate and glabrous on each side of the oral fossa and by the presence of a short psammophore on the mandible, lower gena (Fig. 1154), and forefemur. It differs from similar species in having an obtusely tridentate clypeal lamella (Fig. 1152). Like *P. setiferum*, its mid- and hindtibial spurs are whitish rather than black or brown (ferruginous in *P. ciliatum*).

The male has the apical margin of sternum VIII rounded (Fig. 1155), without apicolateral corner or any specialized structure on its surface. It is furthermore characterized by the free margin of the clypeal lamella slightly concave on each side of the midpoint and with a slightly, obtusely prominent lateral corner (Fig. 1153), many punctures on the scutal disk more than one diameter apart, the punctures of sterna II and III many diameters apart. The whitish mid- and hindtibial spurs are a subsidiary recognition feature. Unlike *P. parvum*, the setae of the lower gena





FIGURES 1152-1157. *Pison triodon* Pulawski, sp. nov. (1152) Female clypeus; (1153) Male clypeus and mandible (arrow shows lateral corner of clypeal lamella); (1154) Lower gena of female showing psammophore; male: (1155) Sternum VIII (ventral surface); (1156) Genitalia in dorsal view; (1157) Genitalia in lateral view.

are suberect, slightly sinuous, as long as midocellar diameter (rather than curved, subappressed, shorter than midocellar diameter) and sternum II impunctate apicomesally (rather than punctate throughout).

**DESCRIPTION.**—Frons dull, superficially punctate, punctures nearly compressed against each other in female, less than one diameter apart in male. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, either less than one diameter apart or many punctures on disk averaging about one diameter apart. Tegula enlarged. Mesopleural punctures largely concealed by vestiture in fresh specimens, less than one diameter apart in female, averaging about one diameter apart in male. Postspiracular carina present, as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum densely punctate (interspaces linear) or obliquely ridged (partly or all), punctate between ridges; side ridged, punctate between ridges except impunctate anteriorly; posterior surface transversely ridged except laterally. Hindcoxal dorsum with outer margin either obtusely or sharply carinate. Punctures of tergum I less than one diameter apart on horizontal part in female, about one diameter apart in male. Sterna II-IV minutely punctate, punctures sparse, many diameters apart.

Setae silvery, appressed on scutum (a few setae may be suberect), and tergum I; frontal setae oriented ventrally in ventral half, oriented dorsally in dorsal half, oriented radially around midocellus; largely concealing integument on clypeus; see below for setae of lower gena. Apical depressions of terga with silvery, setal fasciae.

Head, thorax, propodeum, and gaster black, mandible ferruginous except basally and apically; flagellum brown to yellowish brown ventrally. Legs black, apical tarsomere brown or ferruginous; mid- and hindtibial spurs whitish.

♀.—Upper interocular distance equal to  $0.70\text{--}0.72 \times$  lower interocular distance; ocellocular distance equal to  $0.7\text{--}0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $1.4\text{--}1.7 \times$  hindocellar diameter; eye height equal to  $0.88\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella obtusely tridentate (Fig. 1152). Dorsal length of flagellomere I  $1.8\text{--}1.9 \times$  apical width, of flagellomere IX  $1.0\text{--}1.3 \times$  apical width. Lower gena (Fig. 1154), mandibular posterior margin, and forefemoral venter with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $0.5 \times$ ,  $0.5\text{--}0.7 \times$ , and  $0.3\text{--}0.4 \times$ , respectively, of greatest forefemoral width); lower gena impunctate and asetose between oral fossa and psammophore. Mandible: trimmal carina with small incision at about midlength. Length  $5.9\text{--}6.8$  mm; head width  $1.8\text{--}2.2$  mm.

♂.—Upper interocular distance equal to  $0.86 \times$  lower interocular distance; ocellocular distance equal to  $1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.5 \times$  hindocellar diameter; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella slightly concave on each side of midpoint, with slightly, obtusely prominent lateral corner (Fig. 1153). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $0.8 \times$  apical width; flagellomeres III-VI insignificantly convex ventrally. Sternum VIII rounded apically, without apicolateral corner (Fig. 1155). Genitalia: Figs. 1156, 1157. Length  $6.6$  mm; head width  $2.0$  mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1158).—Northwestern part of Northern Territory.

**RECORDS.**—**HOLOTYPE:** ♀, **AUSTRALIA: Northern Territory:** Victoria Highway 38.5 km SW Timber Creek at  $15^{\circ}42'40''\text{S}$   $130^{\circ}07'48''\text{E}$ , 15-19 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (ANIC).

**PARATYPES:** **AUSTRALIA: Northern Territory:** Keep River National Park at  $15^{\circ}45'30''\text{S}$   $129^{\circ}06'28''\text{E}$ , 6-9 June 2001, E. Irwin, F.D. Parker, and C. Lambkin (1 ♀, CAS), at  $15^{\circ}47'49''\text{S}$   $129^{\circ}06'31''\text{E}$ , 6-8 June 2001,



M.E. Irwin, F.D. Parker, and C. Lambkin (2 ♀, CAS), and at 15°54'55"S 129°04'11"E, 31 May – 3 June 2001, T. Weir, K. Pullen, P. Bouchard (1 ♀, ANIC); Sterling Creek crossing on Buntine Highway 91 km SW Kalkarinji at 17°40'36"S 130°00'24"E, 11–17 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Victoria Highway 38.5 km SW Timber Creek at 15°42'40"S 130°07'48"E, M.E. Irwin, F.D. Parker, and C. Lambkin, 6–13 June 2021 (2 ♀, CAS), 13–19 June 201 (4 ♀, CAS), and 15–19 June 2001 (5 ♀, ANIC; 5 ♀, CAS).



FIGURE 1158. Collecting localities of *Pison triodon* Pulawski, sp. nov.

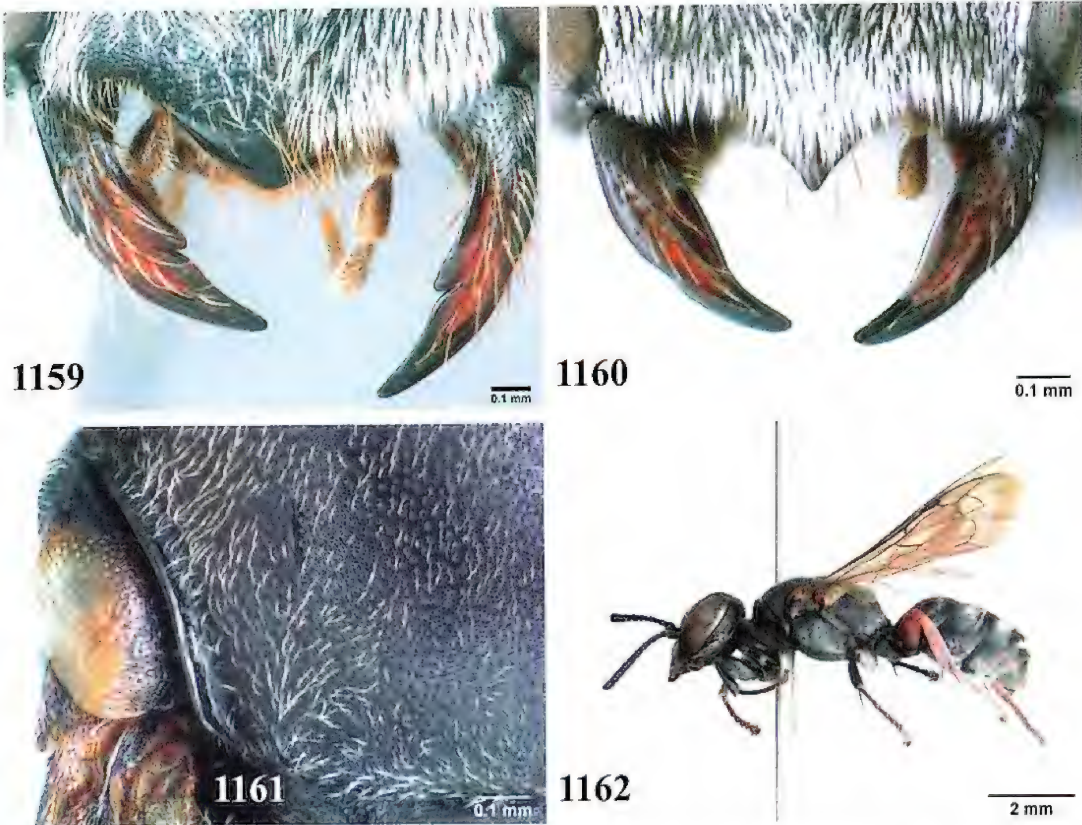
***Pison variipes* Pulawski, species nova**

Figures 1159–1166.

**NAME DERIVATION.**—The name *variipes* is derived from two Latin words: the adjective *varius*, meaning *various* or *varied*, and the noun *pes*, *the leg*, a noun in apposition to the generic name; with reference to the varied leg color of this species.

**RECOGNITION.**—*Pison variipes* has a black head, thorax, propodeum, and gaster, three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, setae appressed on tergum I, and not sinuous, shorter than one midocellar diameter on the lower gena. Its most outstanding characteristic is the unique coloration of the legs: the fore- and midlegs are black (midlegs in many specimens with small ferruginous sections), whereas the hindfemur, hindtibia and hindtarsus are contrastingly ferruginous (Fig. 1162). Subsidiary recognition features are: scutal punctures at least one diameter apart (many punctures up to two diameters apart in most specimens), ocellocular distance  $1.4\text{--}1.6 \times$  hindocellar diameter in the female and  $1.9\text{--}2.0 \times$  in the male, sternum II punctate throughout (punctures up to about 2–3 diameters apart mesally), trimmal carina of female mandible with a small preapical tooth (tooth large in *P. protrudens*), free margin of clypeal lamella roundly arcuate (roundly triangular in *P. protrudens*), male sternum VIII with inconspicuous punctures (conspicuous in *P. areniferum*), emarginate apically (Fig. 1163).

**DESCRIPTION.**—Frons dull, finely punctate, punctures averaging about one diameter apart. Occipital carina joining hypostomal carina. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging about one diameter apart, several punctures up to two diameters apart in female and most males; interspaces microsculptured (Fig. 1161). Tegula enlarged. Mesopleural punctures less than one diameter apart; interspaces dull. Postspiracular carina present, almost as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with irregular oblique ridges that efface toward side, punctate between ridges, with short transverse carinae emerging from middle carina; side ridged, punctate between ridges; posterior surface with well-defined ridges. Hindcoxal dorsum with outer margin not carinate. Punctures of tergum I well defined, averaging less than one diameter apart. Sternum II punctate throughout.



FIGURES 1159-1162. *Pison variipes* Pulawski, sp. nov. (1159) Female clypeus and mandibles; (1160) Male clypeus; (1161) Female tegula and adjacent scutum; (1162) Female body.

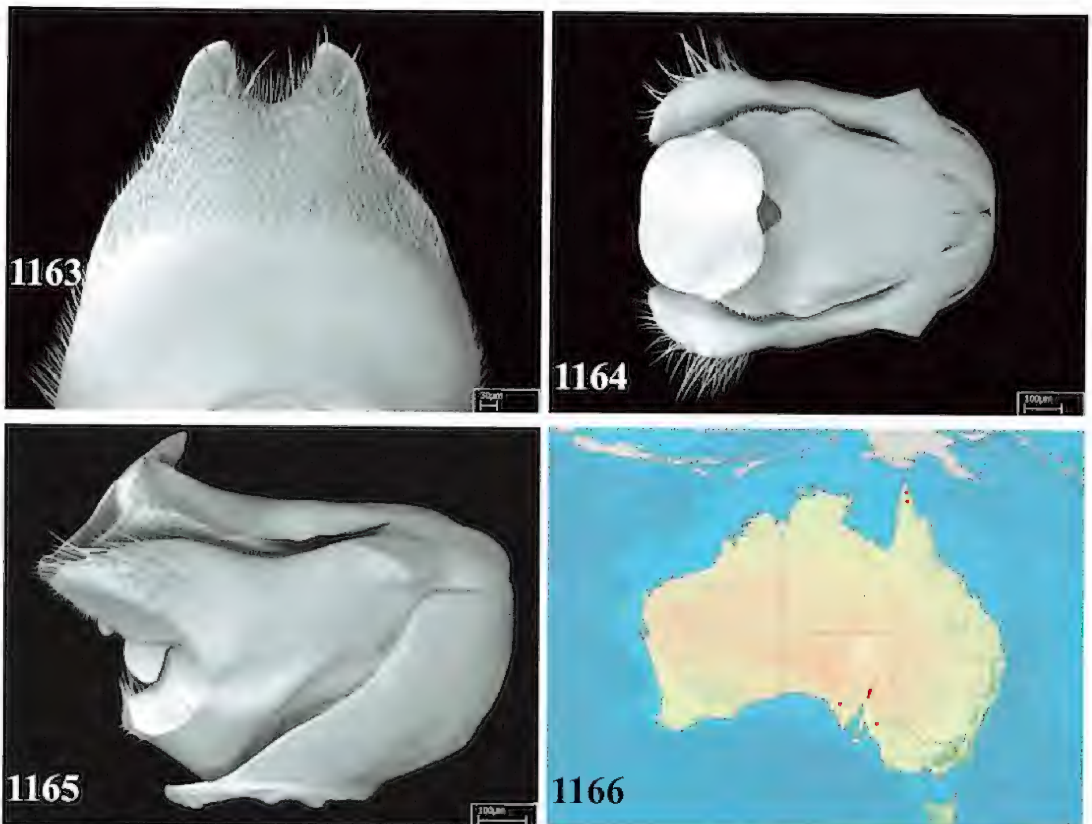
Setae silvery, appressed and oriented ventrally on frons, dorsal half of frons also with sparse erect setae about as long as  $0.5 \times$  midocellar diameter; appressed on scutum and tergum I; on lower gena subappressed to suberect, straight (curved apically in female), about as long as  $0.7 \times$  midocellar diameter in female, about  $0.5 \times$  in male; not entirely concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Head (including antenna), thorax, propodeum, and gaster black; mandible yellowish brown mesally. Fore- and midlegs black except in most specimens midfemur ferruginous anteroapically and in one male midfemur ferruginous dorsally; hindfemur, hindtibia, and hindtarsus ferruginous.

♀ (Fig. 1162).— Upper interocular distance equal to  $0.92-0.98 \times$  lower interocular distance; ocellular distance equal to  $1.4-1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $1.3-1.4 \times$  hindocellar diameter; eye height equal to  $0.92-0.96 \times$  distance between eye notches. Free margin of clypeal lamella obtusely rounded (Fig. 1159). Dorsal length of flagellomere I  $1.9 \times$  apical width, of flagellomere IX  $1.1 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength, with small tooth basally of incision (Fig. 1159). Length 7.2-7.7 mm; head width 2.3-2.4 mm.

♂.— Upper interocular distance equal to  $0.98 \times$  lower interocular distance; ocellular distance equal to  $1.9-2.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.5 \times$  hindocellar diameter; eye height equal to  $0.94-0.96 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1160). Dorsal length of flagellomere I  $1.7-1.9 \times$  apical width, of





FIGURES 1163-1165. *Pison variipes* Pulawski, sp. nov., male. (1163) Sternum VIII (ventral surface); (1164) Genitalia in dorsal view; (1165) Genitalia in lateral view.

FIGURE 1166. Collecting localities of *Pison variipes* Pulawski, sp. nov.

flagellomere X  $1.1 \times$  apical width. Sternum VIII with sharply delimited impunctate basal part and densely punctate apical part, with clearly emarginate apical margin; apicolateral corner obtuse (Fig. 1163). Genitalia: Figs. 1164, 1165. Length 6.6-6.9 mm; head width 2.0-2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1166).— Queensland and South Australia.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: South Australia:** Brookfield Conservation Park at 34°21'S 130°29'E, 24-26 Nov 1992, I.D. Naumann and J.C. Cardale (ANIC).

**PARATYPES:** **AUSTRALIA: Queensland:** 7 km S Batavia Downs at 12°43'S 142°42'E, 19 June – 22 July 1992, P. Zborowski and E.S. Nielsen (1 ♂, ANIC); Heathlands at 11°45'S 142°35'E, 27 Jul – 18 Aug 1992, P. Zborowski and J.C. Cardale (1 ♂, ANIC). **South Australia:** Dingly Dell Camp on Orparinna Creek at 31°21'S 138°42'E, 4-10 Nov 1987, I.D. Naumann and J.C. Cardale (2 ♀, 3 ♂, ANIC); Gawler National Park at 32°35.1'S 135°26.3'E, 7 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♀, CAS); Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E, 27 Jan 2011, V. Ahrens and W.J. Pulawski (2 ♀, 1 ♂, CAS); 3 km ENE Wilpena at 31°31.0'E 138°36.6'E, V. Ahrens and W.J. Pulawski, 26 Jan 2011 (2 ♀, 1 ♂, CAS) and 27 Jan 2011 (2 ♀, 2 ♂, CAS); Wilpena Pound Gap at 31°33'S 138°36'E, 5-6 Nov 1987, I.D. Naumann and J.C. Cardale (1 ♂, ANIC); 34 km S Wilpena, 4 Jan 1980, R.M. Bohart (1 ♀, UCD).

*Pison vestitum* F. Smith

Figures 1167-1174.

*Pison vestitum* F. Smith, 1956:315, ♀ (as *vestitus*, incorrect original termination). Lectotype: ♀, Australia: no specific locality (BMNH), **present designation**, examined. — F. Smith, 1869:290 (in checklist of *Pison*, as *vestitus*); Kohl, 1885:189 (in checklist of world *Pison*); Froggatt, 1892:218 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1916b:598 (in key to Australian *Pison*), 613 (good species, as *vestitus*); R. Bohart and Menke, 1976:337 (in checklist of world Sphecidae); Cardale, 1985:263 (in catalog of Australian Sphecidae).

*Pison pulchrum* Turner, 1916b:613, ♀, ♂. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. **New synonym.** — Turner, 1916b:598 (in key to Australian *Pison*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Cardale, 1985:261 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.**— Smith (1856) did not indicate the number of specimens examined in the original description of *Pison vestitum*. I have designated as the lectotype of this species the only specimen, a female, in The Natural History Museum, London. It bears a label "*vestitus* Sm. Type".

Turner described *Pison pulchrum* from both female and male specimens originating from Mackay and Kuranda, Queensland. Five females and one male from Mackay and one female from Kuranda, all collected by Turner, are present in The Natural History Museum. I have selected as lectotype a female from Mackay bearing the label "*Pison pulchrum* Turn. Type" and designated the remaining specimens as paralectotypes.

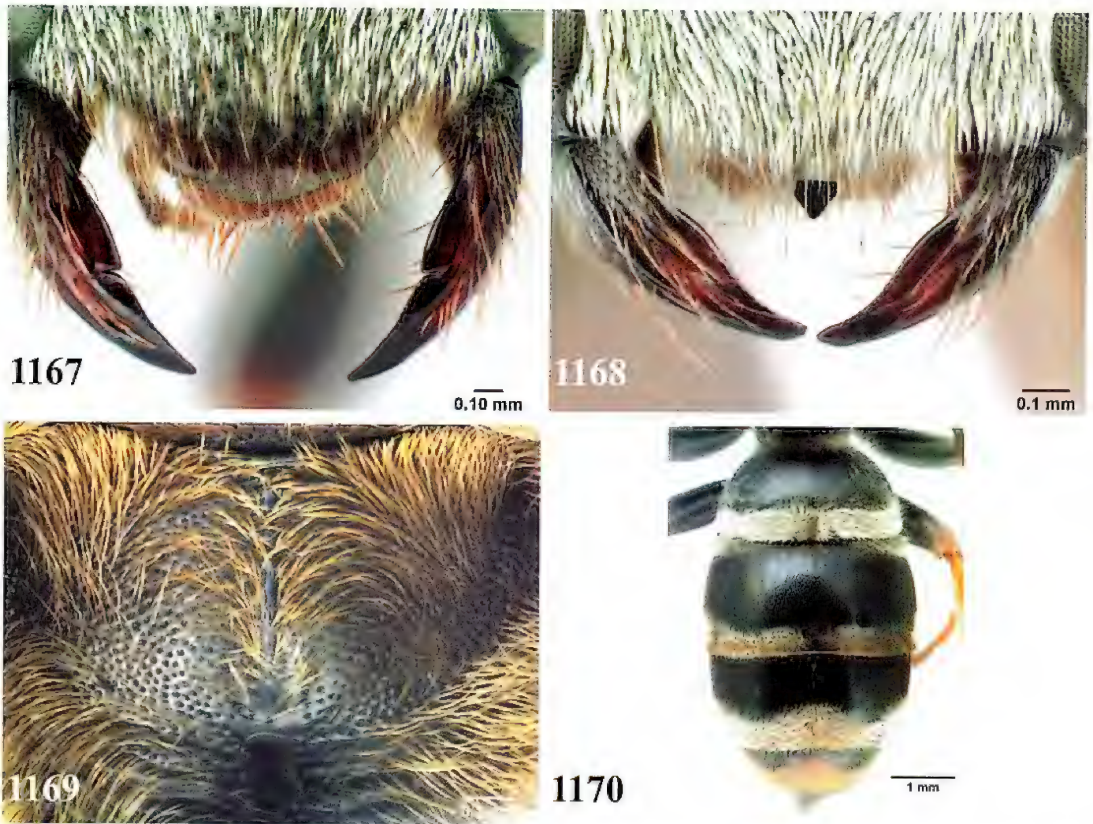
**RECOGNITION.**— *Pison vestitum* has three submarginal cells, the second recurrent vein joining the second intersubmarginal vein or nearly so, tegula largely unsculptured, gaster all black (apical setal fasciae golden), and sterna conspicuously punctate throughout; the setae of tergum I are erect in most specimens, only slightly longer than midocellar diameter in some specimens, all appressed in rare specimens.

The female resembles *Pison simillimum* in having the clypeal lamella unusually short, about as long mesally as laterally and without lateral corner, the acetabular groove of the mandible with two rows of setae, and the tibiae and tarsi ferruginous (tibiae and tarsi black in some *P. simillimum*). Unlike *P. simillimum*, the mesopleural punctures of *P. vestitum* are only slightly larger than the scutal punctures (rather than markedly larger), the scutal setae are erect or suberect, about as long as the midocellar diameter (rather than appressed, markedly shorter than the midocellar diameter), the propodeal dorsum is punctate (rather than ridged), and in most specimens the setae are erect on tergum I (rather than appressed).

As in *P. dives* and *P. simillimum*, male tergum VII is emarginate apically (see Fig. 1011). Unlike *P. dives*, the tibiae and tarsi are ferruginous in *P. vestitum* (rather than all black), the mesopleural punctures average less than one diameter apart (more than one diameter apart in *P. dives*), and the tegula is evenly rounded (in *P. dives* the anterior half of the outer margin is straight or slightly concave, markedly contrasting with the remaining margin). Unlike *P. simillimum*, the scutal punctures of *P. vestitum* are only slightly smaller than the mesopleural punctures (rather than markedly smaller), the scutal setae are erect or suberect, about as long as the midocellar diameter (rather than appressed, markedly shorter than the midocellar diameter), the hindfemur is not incrassate apically (rather than incrassate), and in most specimens the setae are erect on tergum I (rather than appressed).

**JUSTIFICATION OF NEW SYNONYMY.**— Turner (1916b:514) discussed the differences between *Pison pulchrum* and *P. vestitum*: the presence or absence of golden fascia on tergum II, color of antenna and legs, and the distance between eyes at the clypeus and at the vertex. A closer analysis,





FIGURES 1167-1170. *Pison vestitum* F. Smith. (1167) Female clypeus and mandibles; (1168) Male clypeus and mandibles; (1169) Propodeal dorsum of female in dorsal view; (1170) Female gaster in dorsal view.

however, shows that these characters fell within the range of individual variation. Also, Turner did not pay attention to the shared essential characters of these presumed two species, such as the mesopleural and propodeal punctation, and in the female the medioventral clypeal concavity and the shape of the clypeal lip.

**DESCRIPTION.**—Frons dull, microsculptured, finely punctate, punctures of upper frons about one diameter apart. Occipital carina joining hypostomal carina. Ventral margin of labrum rounded or shallowly emarginate. Anteromedian pronotal pit transversely elongate, about  $3 \times$  as long as midocellar diameter. Propleuron either all densely punctate or sparsely punctate anteriorly. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures averaging less than one diameter apart (punctures behind center mesally may be more than one diameter apart). Mesopleural punctures well defined, larger than those on scutum, averaging less than one diameter apart but well separated from one another; interspaces inconspicuously microsculptured, shiny. Tegula slightly enlarged. Postspiracular carina evanescent to absent. Metapleural sulcus inconspicuously costulate between dorsal and ventral metapleural pits. Propodeum in most specimens with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina absent in many specimens); dorsum punctate (Fig. 1169), some punctures less, others more than one diameter apart, interspaces slightly microsculptured, in many specimens not merging into ridges), with series of short, transverse carinae emerging from middle carina, in many specimens also with oblique ridges next to



FIGURES 1171-1173. *Pison vestitum* F. Smith, male. (1171) Sternum VIII (ventral surface); (1172) Genitalia in dorsal view; (1173) Genitalia in lateral view.

foremargin; side punctate, interspaces in many specimens merging into minute ridges (ridges more conspicuous posteriorly); posterior surface conspicuously transversely ridged. Hindcoxal dorsum with outer margin sharply carinate in apical two thirds. Punctures of tergum I more than one diameter apart on anterior slope, markedly less than one diameter apart adjacent to apical depression laterally.

Sterna conspicuously punctate throughout.

Setae varying from intense golden to silvery, but erect setae on upper frons and scutum dark brown in many specimens, silvery in some; erect on upper frons, thorax, forecoxal venter, fore- and midfemoral venters; setae of tergum I erect in most specimens, only slightly longer than midocellar diameter in some specimens, all appressed in rare specimens; not concealing integument on clypeus; setae of lower gena of two types: subappressed, curved, shorter than midocellar diameter, and suberect, sinuous, about  $1.5 \times$  midocellar diameter; setal length (expressed as a fraction of midocellar diameter):  $1.5 \times$  on upper frons, about  $1.0 \times$  on scutum, up to  $1.0 \times$  on fore- and midfemoral venters. Apical depressions of terga with setal fasciae that conceal integument (fascia of tergum I particularly well developed), except fascia of tergum II in many specimens visible only from certain angles and not concealing integument (but well defined laterally), thus contrasting with those of adjacent terga (Fig. 1170).

Head, thorax, propodeum, and gaster black (apical depressions of terga II-V brown); mandible all black or dark ferruginous subapically; antenna all black or scape, pedicel and basal three flagellomeres ferruginous. Femora all ferruginous to nearly all black; tibiae and tarsi ferruginous, tarsal apex dark brown in some specimens

♀.—Upper interocular distance equal to  $0.66-0.68 \times$  lower interocular distance; ocellular distance equal to  $0.6-1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-1.0 \times$  hindocellar diameter; eye height equal to  $0.90-0.92 \times$  distance between eye notches. Clypeal lamella wider than distance that separates it from eye margin, its free margin broadly arcuate (Fig. 1167); clypeal surface slightly concave adjacent to lamella. Dorsal length of flagellomere I  $2.8-3.3 \times$  apical width, of flagellomere IX  $1.2-1.6 \times$  apical width. Mandible: trimmal carina with small inci-



sion at about two thirds of length; acetabular carina, in some specimens, with two rows of punctures. Tergum VI narrowly rounded apically. Length 9.2-12.5 mm; head width 2.5-3.5 mm.

♂.—Upper interocular distance equal to  $0.74-0.78 \times$  lower interocular distance; ocellocular distance equal to  $1.1-1.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9-1.1 \times$  hindocellar diameter; eye height equal to  $0.92 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1168). Dorsal length of flagellomere I  $3.0 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Apical margin of tergum VII slightly concave. Sternum VIII conspicuously emarginate apically (Fig. 1171). Genitalia: Figs. 1172, 1173. Length 8.4-10.4 mm; head width 2.3-3.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1174).—

New South Wales, Northern Territory, Queensland, South Australia, Western Australia.

**RECORDS.— AUSTRALIA: Australian Capital**

**Territory:** Black Mountain (1 ♀, ANIC), Canberra (1 ♀, ANIC), Canberra: Paddys River (1 ♂, BMNH). **New South Wales:** 4 km N Bilpin near Kurrajong (1 ♀, AMS), 6 km NE Bilpin (1 ♂, AMS); Binnaway: Tipaminka Brooks Road (2 ♀, AMS), Cheltenham (2 ♀, AMS), Coolbaggie Forest Reserve 10 km E Eumungerie at  $31^{\circ}58.5'S$   $148^{\circ}40.5'E$  (3 ♀, CAS), Fraser Park (1 ♀, AMS), Gilgandra Flora Reserve at  $31^{\circ}39.7'S$   $148^{\circ}46.3'E$  (1 ♀, CAS), Hornsby (1 ♀, AMS), Iluka: Clarence River (1 ♀, AMS), 16 km N Mudgee (1 ♂, ANIC), Nadgee Nature Reserve 10 km S Newton's Beach (2 ♀, 2 ♂, ANIC), 2.7 km NE Queanbeyan (1 ♀, ANIC), Rock National Park (1 ♀, QMB), 23 km SE Tamworth (1 ♀, ANIC), Warrumbungle National Park at  $31^{\circ}16.9'S$   $148^{\circ}59.1'E$  (1 ♀, AMS; 7 ♀, 5 ♂, CAS), West Pymble near Sydney (1 ♀, AMS), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (2 ♀, 1 ♂, CAS). **Northern Territory:** 7 km NNW Cahills Crossing on East Alligator River at  $12^{\circ}23'S$   $132^{\circ}56'E$  (1 ♀, ANIC), Nourlangie Rock in Kakadu National Park (1 ♂, ANIC). **Queensland:** Agnes Water 40 km E Miriam Vale (1 ♂, AMS), Atherton at  $17^{\circ}17'S$   $145^{\circ}29'E$  (2 ♀, ANIC), 10 km S Ayr (2 ♂, AMS), 15 km WNW Bald Hill in McIlwraith Range at  $13^{\circ}43'S$   $143^{\circ}19'E$  (1 ♂, ANIC), Ban Ban Range (1 ♀, ANIC), 4 km NE Batavia Downs at  $12^{\circ}39'S$   $142^{\circ}42'E$  (3 ♀, 7 ♂, ANIC), The Bend 3 km NW Coen at  $13^{\circ}56'S$   $143^{\circ}12'E$  (1 ♀, ANIC), Biggenden (1 ♀, ANIC), Biggenden: Bluff Range (3 ♀, ANIC), Brisbane: Blunder Creek (5 ♀, QMB), near Brisbane Forest Park at  $27^{\circ}26.0'S$   $152^{\circ}55.4'E$  (1 ♀, CAS), Brisbane: Indooroopilly (1 ♀, 1 ♂, BMNH), Brisbane: Karawatha Forest at  $27^{\circ}38.6'S$   $143^{\circ}04.2'E$  (2 ♀, CAS), Brisbane: Long Pocket (1 ♀, ANIC), Brisbane: Mount Coot-tha (3 ♀, CAS), Bundaberg (5 ♀, 1 ♂, ANIC; 2 ♂, BMNH), Bundaberg: Baldwin Swamp (1 ♀, AMS), Cairns (1 ♀, CAS), Cairns District (2 ♂, SAM), Camarvon National Park (1 ♀, QMB), Coen at  $13^{\circ}57'S$   $143^{\circ}12'E$  (2 ♀, ANIC), Cooloola National Park 4 km W Rainbow Beach (2 ♀, CAS), Crediton State Forest at  $21^{\circ}11.7'S$   $148^{\circ}29.9'E$  (3 ♀, 2 ♂, CAS), Curtain Fig 2 km SSW Yungaburra at  $17^{\circ}17'S$   $145^{\circ}34'E$  (1 ♂, ANIC), 9 km S Dingo Beach at  $20^{\circ}05.5'S$   $148^{\circ}30.2'E$  (1 ♀, CAS), Elliott Heads 10 mi. E Bundaberg (1 ♀, ANIC), Etty Bay 6 km SE Innisfail (1 ♂, AMS), Eungella National Park at  $21^{\circ}10.5'S$   $148^{\circ}30.3'E$  (2 ♀, 1 ♂, CAS), Fletcher Creek 43 km NW Charters Towers at  $19^{\circ}48.9'S$   $146^{\circ}03.3'E$  (1 ♀, CAS), Haliday Bay 50 km N Mackay (1 ♀, AMS), Heathlands at  $11^{\circ}45'S$   $142^{\circ}35'E$  (4 ♀, 2 ♂, ANIC), 12 km SSE Heathlands at  $11^{\circ}51'S$   $142^{\circ}38'E$  (2 ♀, ANIC), Homevale National Park at  $21^{\circ}26.9'S$   $148^{\circ}32.4'E$  (5 ♀, CAS), 14 km NW Hope Vale Mission at  $15^{\circ}16'S$   $144^{\circ}59'E$  (2 ♀, ANIC), Kuranda (2 ♀, BMNH, including one paralectotype of *Pison pulchrum*), Kuranda: Russet Park (4 ♀, CAS), Lake Broadwater 25 km SW Dalby at  $27^{\circ}21.4'S$   $151^{\circ}05.9'E$  (1 ♀, CAS), Lamington National Park at  $28.142^{\circ}S$   $153.133^{\circ}E$  (5 ♀, 4 ♂, QMB),  $28.148^{\circ}S$   $153.137^{\circ}E$  (2 ♀, QMB), and  $28.151^{\circ}S$   $153.137^{\circ}E$  (1 ♀, QMB), Laura River 14 km S Laura (1 ♀, ANIC), 5 km N Leyburn at  $27^{\circ}58'S$   $151^{\circ}38'E$  (1 ♀, QMB), Mackay (1 ♀, BMNH; 5 ♀, 1 ♂, BMNH, lectotype and paralectotypes of *Pison pulchrum*), Mareeba and around (1 ♀, CAS), 65 km N Marlborough (1 ♀,



FIGURE 1174. Collecting localities of *Pison vestitum* F. Smith.

AMS), Mission Beach (2 ♀, AMS), Mount Lammond in Iron Range (1 ♀, AMS), Mount Lewis near Mossman (2 ♀, AMS), Mount Walsh National Park near Biggenden (3 ♀, ANIC), Mount Webb National Park at 15°04'S 145°07'E (1 ♀, ANIC), 3 km NE Mount Webb at 15°03'S 145°09'E (1 ♀, ANIC), Mungkan Kanju National Park at 13°27'S 142°45'E (1 ♀, ANIC), Noosa (1 ♀, QMB), North Stradbroke Island: 10 km N Dunwich at 26°55'S 153°09'E (1 ♀, QMB), 4 km SSE Peak Hill at 10°45'S 142°27'E (1 ♀, ANIC), Pinnacle Creek 27 km N Archer Crossing (1 ♀, ANIC), 3 km upstream from Quintell Beach (1 ♀, AMS), Ravenshoe (1 ♂, AMS), 2 km N Rokeby at 13°39'S 142°40'E (4 ♀, ANIC), Split Rock 14 km SE Laura at 15°39'S 144°31'E (6 ♀, 1 ♂, ANIC), Toogoom (1 ♀, QMB), 50 km NW Townsville (1 ♂, RMNH), Walkerston near Mackay (1 ♀, AMS), Watalgan Range (1 ♀, ANIC), Woodgate 35 km E Childers (1 ♀, AMS). **South Australia:** Kings Mill Creek near Arkaroola (1 ♀, SAM), Trezona Camp at Brachina Creek at 31°20'S 138°37'E (1 ♂, ANIC), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (8 ♀, CAS), 3 km ENE Wilpena at 31°31.0'S 138°36.6'E (8 ♀, CAS). **Victoria:** Melbourne (1 ♀, BMNH). **Western Australia:** Avon Valley in Walyunga National Park (1 ♀, WAM), Jarrahdale at 32°20'20"S 116°03'43"E (1 ♀, WAM), 7 mi SE Jaarrahdale (1 ♀, RMNH), Marun at 15°00'S 126°21'E (1 ♀, ANIC), Wellington Mills (1 ♀, WAM), Yarloop (1 ♀, AMS). **No specific locality:** 1 ♀, BMNH, lectotype of *Pison vestitum*.

### *Pison virosum* Turner

Figures 1175-1182.

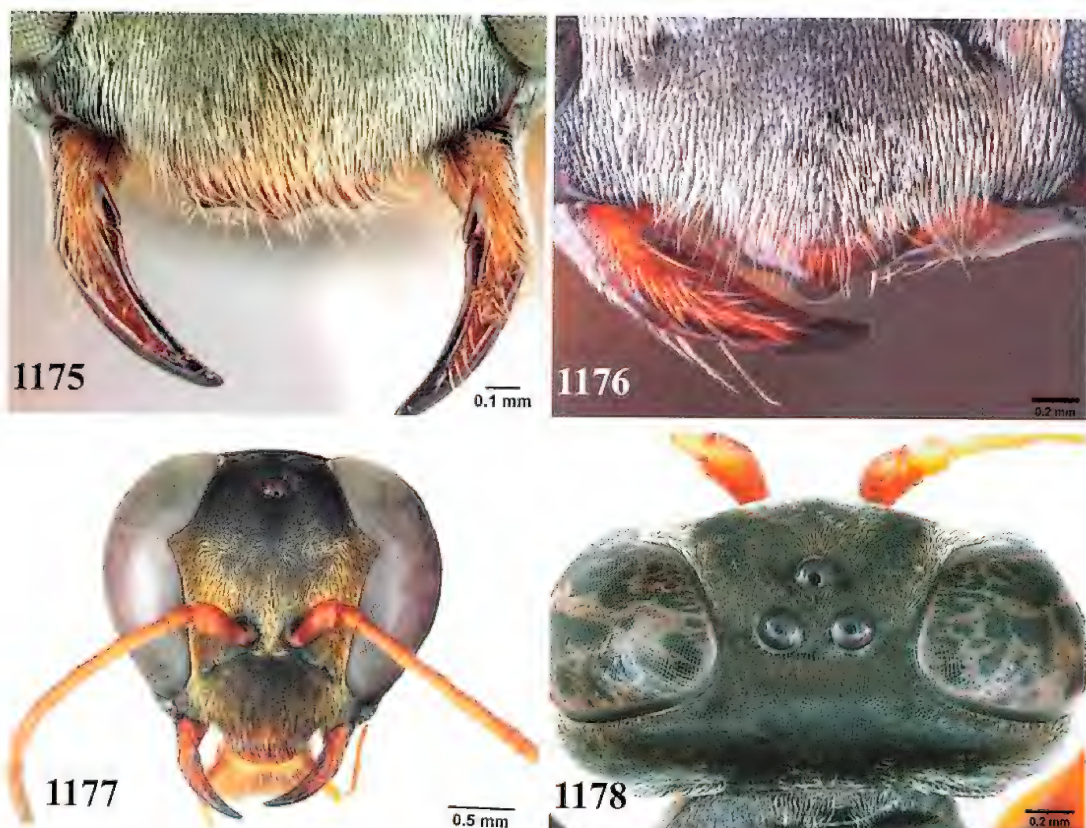
*Pison virosum* Turner, 1908:513, ♀, ♂. Lectotype: ♀, Australia: Queensland: Mackay (BMNH), **present designation**, examined. – Turner, 1916b:596 (in key to Australian *Pison*), 602 (bibliographic reference, recognition); Richards, 1930:91 (nest structure); R. Bohart and Menke, 1976:337 (in checklist of world Sphecidae); Cardale, 1985:262 (in catalog of Australian Sphecidae).

**LECTOTYPE DESIGNATION.** Three females and one male of this species, all from Mackay (the type locality) are present at The Natural History Museum, London. I have designated one female as the lectotype and the remaining specimens as paralectotypes.

**RECOGNITION.**— *Pison virosum* is characterized by the second recurrent vein joining the second submarginal cell near its middle. The female differs from the other species with this type of venation in having an obtusely tridentate free margin of the clypeal lip (Fig. 1175), similar to that of *Pison exclusum*, and the distance between an antennal socket and the adjacent orbit twice the socket width; and the male by the distance between an antennal socket and the adjacent orbit greater than the socket width combined with the free margin of the clypeal lip obtusely pointed mesally and concave on each side of the midpoint (Fig. 1176), and also by an unusual, gibbose tegula. The golden frontal and clypeal setae (strictly appressed on the frons) and the evanescent setal fasciae on the apical depressions of the terga are subsidiary recognition features.

**DESCRIPTION.**— Frons dull, minutely punctate, punctures less than one diameter apart. Distance between antennal socket and adjacent orbit twice socket width in female (Fig. 1177), greater than socket width in male. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about 2.5-3.5 × as long as midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin. Scutal and mesopleural punctures minute, less than one diameter apart on scutum, about one diameter apart on mesopleuron. Tegula slightly enlarged, microscopically punctate throughout. Postspiracular carina present, about twice as long as midocellar diameter; integument in females and some males depressed between postspiracular carina and episternal sulcus. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area towards spiracle, with transverse carinae emerging from its inner and outer sides; dorsum with middle carina in shallow sulcus, obliquely ridged; side finely ridged, punctate between ridges; posterior surface irregularly ridged. Forewing with three submarginal cells; second recurrent vein joining submarginal cell II near its midlength. Hindcoxal dorsum





FIGURES 1175-1178. *Pison virosum* Turner. (1175) Female clypeus and mandibles; (1176) Male clypeus and mandible; (1177) Female head in frontal view; (1178) Male head in dorsal view.

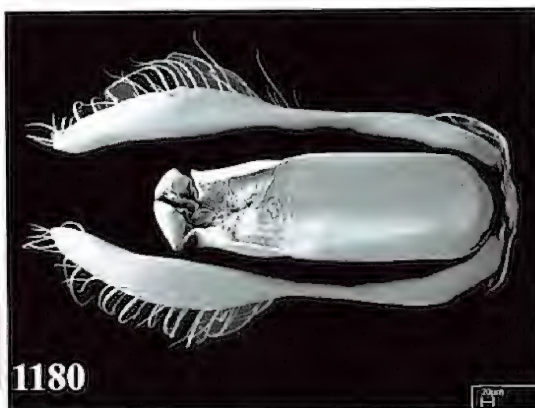
with outer margin not carinate. Punctures of tergum I fine, about one diameter apart. Sternum II impunctate apicomeresally in female, punctate throughout in male.

Setae appressed on whole body, not concealing integument on frons and clypeus, golden in most specimens on frons, clypeus, and terga, setal fasciae evanescent on tergal apical depressions.

Head, thorax, and propodeum black, female clypeus black or ferruginous next to lobe free margin; mandible yellowish red, dark apically; antenna ferruginous. Female fore- and midfemora black, ferruginous apically, hindfemur black, ferruginous in apical fifth or third; male femora black, ferruginous in apical third; tibiae and tarsi ferruginous. Gaster varying from all ferruginous except tergum I narrowly black basally (e.g., specimens from Karawatha Forest, New South Wales and Kuranda, Queensland) to all black (e.g., specimens from Broulee and Wollemi National Park, New South Wales).

♀.— Upper interocular distance equal to  $0.66-0.70 \times$  lower interocular distance; ocellocular distance equal to  $0.7 \times$  hindocellar diameter, distance between hindocelli  $0.5-0.7 \times$  hindocellar diameter; eye height equal to  $1.16 \times$  distance between eye notches. Free margin of clypeal lamella obtusely tridentate (Fig. 1175). Dorsal length of flagellomere I  $3.4-3.8 \times$  apical width, of flagellomere IX  $1.7-1.8 \times$  apical width. Mandible: trimmal carina with minute incision at about one third length. Length 7.6-9.1 mm; head width 2.4-2.5 mm.

♂.— Upper interocular distance equal to  $0.75 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli  $0.7 \times$  hindocellar diameter; eye



Figures 1179-1181. *Pison virosum* Turner, male. (1179) Sternum VIII (ventral surface); (1180) Genitalia in dorsal view; (1181) Genitalia in lateral view.

height equal to  $1.12 \times$  distance between eye notches. Clypeal lamella obtusely tridentate (Fig. 1176). Dorsal length of flagellomere I  $2.7 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Tegula gibbose. Sternum VIII emarginate apically (Fig. 1179). Genitalia: Figs. 1180, 1181. Length 7.2 mm; head width 2.2 mm.

**VARIATION.**— In most females the tegula is virtually unmodified. Its anterior (punctate) portion is conspicuously convex, overhanging the remaining surface, in both females from Lorient, New South Wales.

**NEST.**—According to Richards (1930), a mud nest of this species was found on a piece of wood.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1182).— Australian Capital Territory, New South Wales, Northern Territory, Queensland, Western Australia.

**RECORDS.**— **AUSTRALIA:** Australian Capital Territory: Canberra (1 ♂, ANIC). New South Wales: Broulee (3 ♀, ANIC), Coonabarabran at  $31^{\circ}16.7'S$   $149^{\circ}16.8'E$  (1 ♀, CAS), Doyles River 50 km NW Taree at  $31^{\circ}31'S$   $152^{\circ}14'E$  (1 ♂, AMS), Lorient Wildlife Refuge 3 km N Lansdowne near Taree (3 ♀, 1 ♂, AMS; 1 ♀, 1 ♂, CAS), 0.5 km SE Lansdowne near Taree (3 ♀, 1 ♂, AMS), Mount Kaputar National Park at  $30^{\circ}15.8'S$   $150^{\circ}03.3'E$  (1 ♀, CAS), Norara near Gosford (1 ♀, AMS), Pymble, a northern suburb of Sydney (1 ♀, RMNH), Rookwood, a western suburb of Sydney (1 ♂, CAS), Temagog (1 ♂, USNM), Wollemi National Park (northern edge) at  $32^{\circ}23.4'S$   $150^{\circ}24.8'E$  (15 ♀, CAS), Woroneria River at Engadine (1 ♀, AMS). **Northern Territory:** Fogg Dam 74 km E Darwin (2 ♂, QMB). **Queensland:** Atherton (1 ♀, QMB), near Bingedden (1 ♀, ANIC), Brisbane (2 ♀, ANIC; 1 ♀, CAS, 9 ♀,



FIGURE 1182. Collecting localities of *Pison virosum* Turner.



1 ♂, QMB), Brisbane: Blunder Creek (2 ♀, QMB), Brisbane Forest Park at 27°25'S 152°50'E (1 ♀, MNKB), Brisbane: Indooroopilly (1 ♀, BMNH), Brisbane: Karawatha Forest at 27°38.6'S 153°04.2'E (1 ♀, CAS), Brisbane: Taringa (1 ♀, QMB), Herberton (1 ♀, BMNH), Mackay (3 ♀, 1 ♂, BMNH, lectotype and paratypes of *Pison virosum*), Maryborough at 25°32'S 152°44'E (1 ♀, ANIC), Mount Coot-tha at 27°29'S 152°58'E (1 ♀, ANIC), Russet Park near Kuranda (1 ♀, CAS). **Western Australia:** Guildford (1 ♀, WAM).

***Pison westwoodii* Shuckard**

Figures 1183-1197.

*Pison westwoodii* Shuckard, 1838:77, ♀ (as *Westwoodii*, incorrect original capitalization). Holotype or syntypes, ♀, Australia: Van Diemen's Land, now Tasmania: no specific locality (lost). Neotype: ♀, lectotype of *Pison obliquum* (OXUM), **present designation**. – F. Smith, 1956:316 (in catalog of Hymenoptera in British Museum), 1869:290 (in checklist of *Pison*); Kohl, 1885:189 (in checklist of world *Pison*); Froggatt, 1892:218 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Turner, 1915:558 (in key to *Pison* of Tasmania, relationship to *Pison iridipenne*), 1916b:597 (in key to Australian *Pison*), 604 (variation, recognition characters, *Pison obliquum* is probably a synonym); R. Bohart and Menke, 1976:337 (in checklist of world Sphecidae); Evans, Matthews, and Hook, 1981:224 (nesting behavior); Cardale, 1985:263 (in catalog of Australian Sphecidae); Naumann, 1990a:24 (Norfolk and Philips Islands); K. Walker, Naumann, Austin, Taylor, and Cardale, 1992:49 (in catalog of insects of Tasmania); Naumann, 1993:185 (Australia: Queensland: Heathlands area in Cape York); Baker, 1998:173 (origin and depository of type material); Smithers, 1998:46 (in list of insects of Norfolk Island).

*Pison obliquum* F. Smith, 1856:316, ♀ (as *obliquus*, incorrect original termination). Lectotype: ♀, Australia: Van Diemen's Land (now Tasmania): no specific locality (OXUM), **present designation**, examined. **New synonym**. – F. Smith, 1869:291 (in checklist of *Pison*); Turner, 1916b:604 (a tentative synonym of *Pison westwoodii*). – As *Pison obliquum*: Kohl, 1885:187 (in checklist of world *Pison*); Froggatt, 1892:217 (in catalog of Australian Hymenoptera); Dalla Torre, 1897:712 (in catalog of world Hymenoptera); R. Bohart and Menke, 1976:337 (as questionable synonym of *Pison westwoodii*); Cardale, 1985:263 (in catalog of Australian Sphecidae, as junior synonym of *Pison westwoodii*).

*Pison iridipenne* F. Smith, 1879a:676, ♀, ♂ (as *iridipennis*, incorrect original termination). Lectotype: ♂, Hawaiian Islands: Oahu: Honolulu (BMNH), **present designation**, examined. **New synonym**. – Blackburn and Kirby, 1880:88 (Hawaiian Islands); Kohl, 1885:187 (in checklist of world *Pison*); Blackburn and Cameron, 1886:173 (Hawaiian Islands: Honolulu); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); R. Perkins in R. Perkins and Forel, 1899:14 (Hawaiian Islands: Honolulu), 1901:264 (Hawaiian Islands); Turner, 1908:512 Queensland: Cairns, Mackay), 1916b:626 (bibliographic references); Bridwell, 1919b:123 (in key to Hawaiian *Pison*); Giffard, 1919:181 (American Samoa and Hawaii); F. Williams, 1927:438 (common about Honolulu); Cheesman, 1928:176 (Marquesas and Society Islands); Perkins and Cheesman, 1928:6 (listed from Samoa), 28 (Samoa, distinctive characters); F. Williams, 1932 (Marquesas Islands); Krauss, 1944:93 (Hawaii: Molokai Island); F. Williams, 1947:318 and 331 (not known from Fiji); Krombein, 1949b:386 (in key to Sphecidae of Micronesia), 408 (geographic variation; Marshall, Mariana, and Caroline Islands), 1950:139 (additional Micronesian localities); Yasumatsu, 1953:141 (in list of *Pison* of Pacific islands), 141 (bibliographic references; Micronesia); Fullaway, 1957:279 (in checklist of Hymenoptera of Fiji); Yoshimoto, 1960:334 (in list of Hawaiian Sphecidae); Baltazar, 1966:335 (in catalog of Hymenoptera of Philippines); Hinckley 1969:15 (Tokelau Islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Tsuneki, 1976:94 (Philippines; redescription); Menke, 1979:303 (Tahiti); Tsuneki, 1982a:38 (Bismarek Archipelago, redescription), 1983b:42 (in key to *Pison* of New Guinea), 43 (New Guinea); Cardale, 1985:260 (in catalog of Australian Sphecidae); Menke, 1990:154 (*doggonum* may be a junior synonym); Evenhuis, 2007:6 (in checklist of Hymenoptera of Fiji).

*Pison iridipenne* F. Smith, 1879b:139, ♀, ♂ (as *iridipennis*, incorrect original termination). Objective synonym of *Pison iridipenne* F. Smith, 1879a:676.

*Pison strictifrons* Vachal, 1907:114, ♀. Syntypes: New Caledonia: no specific locality (MNHN), photographs examined. **New synonym.** – R. Turner, 1916g:626 (bibliographic reference, morphological characters); Williams, 1945:440 (New Caledonia, recognition characters); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Callan, 1990:20 (New Caledonia: no specific locality); Rasmussen, 2012:46 (in list of species described by Vachal); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia).

*Pison impunctatum* Turner, 1912a:200, ♀. Holotype by monotypy: ♀, Indonesia: Western Papua (= Indonesian New Guinea): Mimika River (BMNH), examined. **New synonym.** – Turner in Turner, Meade-Waldo, and Morley, 1915:6 (New Guinea: Mimika River; redescription); Turner, 1916b:626 (recognition characters, New Guinea); Cheesman, 1928:176 (Marquesas and Society Islands, description of ♂); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Tsuneki, 1983b:42 (in key to *Pison* of New Guinea).

*Pison korrorense* Yasumatsu, 1937b:133, ♀, ♂. Holotype: ♀, Palau Republic: Island of Koror (ELKU), examined. **New synonym.** – Yasumatsu, 1939b:82, 83 (in key to *Pison* of eastern Asia, in checklist of *Pison* of Japanese Empire); Krombein, 1949b:385 (in key to Sphecidae of Micronesia, description of ♂), 409 (possibly a subspecies of *iridipenne*, Caroline Islands), 1950b:134 and 139 (illustrations of head, sternum III, and genitalia); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 141 (bibliographic references; Micronesia); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae; possibly synonym of *Pison iridipenne*).

*Pison doggonum* Menke, 1988a:26, ♀. Holotype: ♀, Mexico: no specific locality, corrected to Western Pacific Islands by Menke, 1990:154, may actually be southeast Asia, New Guinea, or Australia (ZMUC), examined. **New synonym.** – Menke, 1990:154 (possibly a synonym of *iridipenne* F. Smith).

**NEOTYPE AND LECTOTYPE DESIGNATIONS.**— According to the original description (Shuckard, 1838), the type(s) of *Pison westwoodii* belonged to J.O. Westwood, whose collection is now preserved in the Hope Entomological Collections, Oxford. Unfortunately, no specimen of this species can be found there, as James E. Hogan, responsible for the Hymenoptera, informed me in his e-mails of 6 May and 15 July 2011. Shuckard's type material is not present in the Natural History Museum, London, either (information of David G. Notton). I accept therefore that the original type material has been lost. In order to fix this common species interpretation, I hereby select as the neotype the lectotype of *Pison obliquum* F. Smith, 1856 (see next paragraph). Both taxa originated from Van Diemen's Land (now Tasmania), with no specific locality. The original description of *westwoodii* does not allow an unequivocal recognition, but the neotype clearly agrees with the interpretation of Turner, 1916b, the only previous reviser of the Australian *Pison*.

Smith (1856) did not indicate the number of specimens examined in the original descriptions of *Pison obliquum*, but he gave Van Diemen's Land (now Tasmania) as the country of origin and the collection of W.W. Saunders as depository. Two specimens of this species are present in the Hope Entomological Collections, Oxford, under a handwritten label "*obliquus*, V.D.L.". I have selected as the lectotype the one bearing a square handwritten label "V.D.L.", and the other one with undecipherable letters on a square label as the paralectotype.

*Pison iridipenne* F. Smith, 1856, was described from both sexes from Honolulu, Hawaii. I have selected as the lectotype the only existing original specimen in the Natural History Museum, London.

**RECOGNITION.**— *Pison infumatum*, *P. nitens*, and *P. westwoodii* are all black, have three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, and the setae appressed on tergum I. The females are unique among the Australian species in having the ocellocular distance equal to  $0.1\text{--}0.5 \times$  hindocellar diameter (Fig. 1188) in combination with a sparsely punctate mesopleuron (Fig. 1190), with punctures slightly more than one diameter apart to several diameters apart. They differ as follows: in *P. westwoodii*, the frontal punctures are more than one diameter apart, the propodeum of most specimens has a longitudinal



carina separating the dorsum and posterior surface from the side and extending from the gastral socket area toward the spiracle, and the propodeal dorsum of most specimens is at least slightly ridged, with most or all punctures no more than one diameter apart (only the punctures are present except the basal ridges and the median sulcus in some specimens). In the other two species, the frontal punctures are about one diameter apart, there is no longitudinal carina separating the propodeal dorsum and posterior surface from the side, the propodeal dorsum is punctate only, except ridged next to anterior margin, with punctures more than one diameter apart.

The vast majority of males of *P. westwoodii* share with *P. morosum* (an endemic of New Zealand, where *P. westwoodii* does not occur) a sparsely punctate, transverse swelling on sternum III, slightly behind its midlength (Fig. 1191, 1192); in some specimens a swelling is also present on sternum IV. The swelling is entire in most specimens, separated mesally into two sections in some (Fig. 1192). The two species can be differentiated by the following: in *P. westwoodii*, the setae of the upper frons are silvery,  $0.3\text{--}0.4 \times$  as long as midocellar diameter just below the midocellus, the apical portion of sternum II is microscopically punctate, and sternum II is simple. In *P. morosum*, the setae of upper frons are brown and up to  $0.7 \times$  as long as the the midocellar diameter just below the midocellus, the apical portion of sternum II is impunctate, and sternum II has an ill-defined, preapical, medially divided transverse swelling. Somewhat similar are certain males of *P. sulcatum*, in which sternum IV in many specimens (also sternum III in many specimens) has a pair of sharp tubercles (Fig. 1076). Sternum VIII of *P. westwoodii*, however, is simple, whereas in *P. sulcatum* it has a longitudinal sulcus or a round concavity (Fig. 1077-1080).

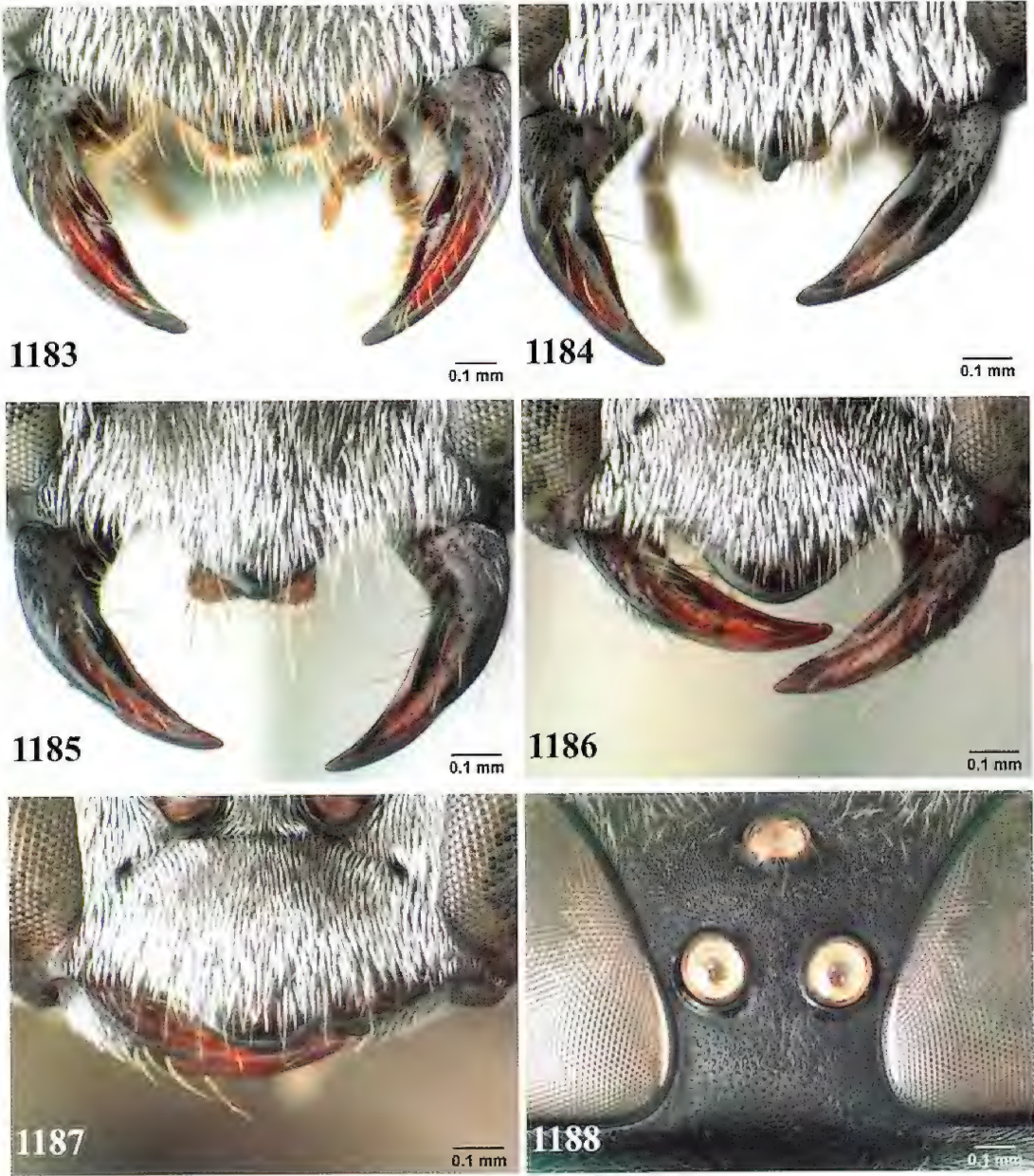
All known males from New Caledonia and some rare males from other areas lack the swelling on sternum II. Such specimens can be recognized by the relatively sparse mesopleural punctures that are slightly more to markedly more than one diameter apart, and the subsidiary recognition features are: body all black, ocellocular distance equal to  $0.3\text{--}0.6 \times$  hindocellar diameter, sterna punctate throughout, and sternum VIII moderately emarginate apically (Fig. 1193). *Pison modestum* is similar, but in that species the posterior propodeal surface is punctate in at least the dorsal half (posterior propodeal surface all ridged in *P. westwoodii*).

**JUSTIFICATION OF NEW SYNONYMY.**—The syntypes of *P. obliquum* and the holotypes of *P. impunctatum* and *P. doggonum* are clearly conspecific with *P. westwoodii*, and I treat them as junior synonyms of the latter name. I regard a different shape of the clypeal lamella in the Hawaiian males (described as *P. iridipenne*) as the result of geographic variation, and I synonymize this name with *P. westwoodii*, too.

I could not examine the syntypes of *Pison strictifrons*, but I have seen the photographs of one female with the original handwritten determination label that Mademoiselle Agn  le Touret-Alby (Mus  um National d'Histoire Naturelle, Paris, France) sent me on 1 August 2017. The photographs clearly show the ocellocular distance smaller than the hindocellus diameter, short setae of the lower gena, the mesopleural punctures more than one diameter apart, the second recurrent vein interstitial with the second intersubmarginal vein, and the propodeal dorsum obliquely ridged. Of the five species currently known to occur in Nova Caledonia, *P. argentatum*, *P. marginatum*, *P. novocaledonicum*, *P. rufipes*, and *P. westwoodii*, the first four are clearly different from *P. strictifrons*, which, however, shows all the characters of *P. westwoodii*. Therefore I synonymize these two names.

The female holotype of *P. korrorense* is identical to specimens of *P. westwoodii* from Australia. The only known male, described by Krombein (1949), resembles the Australian *P. westwoodii* except for the punctures of the upper frons that are nearly contiguous. I regard it as *P. westwoodii* because of the presence of a sparsely punctate, transverse swelling on its sternum III.

**DESCRIPTION.**—Frons bulging above antennal sockets, dull, minutely punctate, punctures more



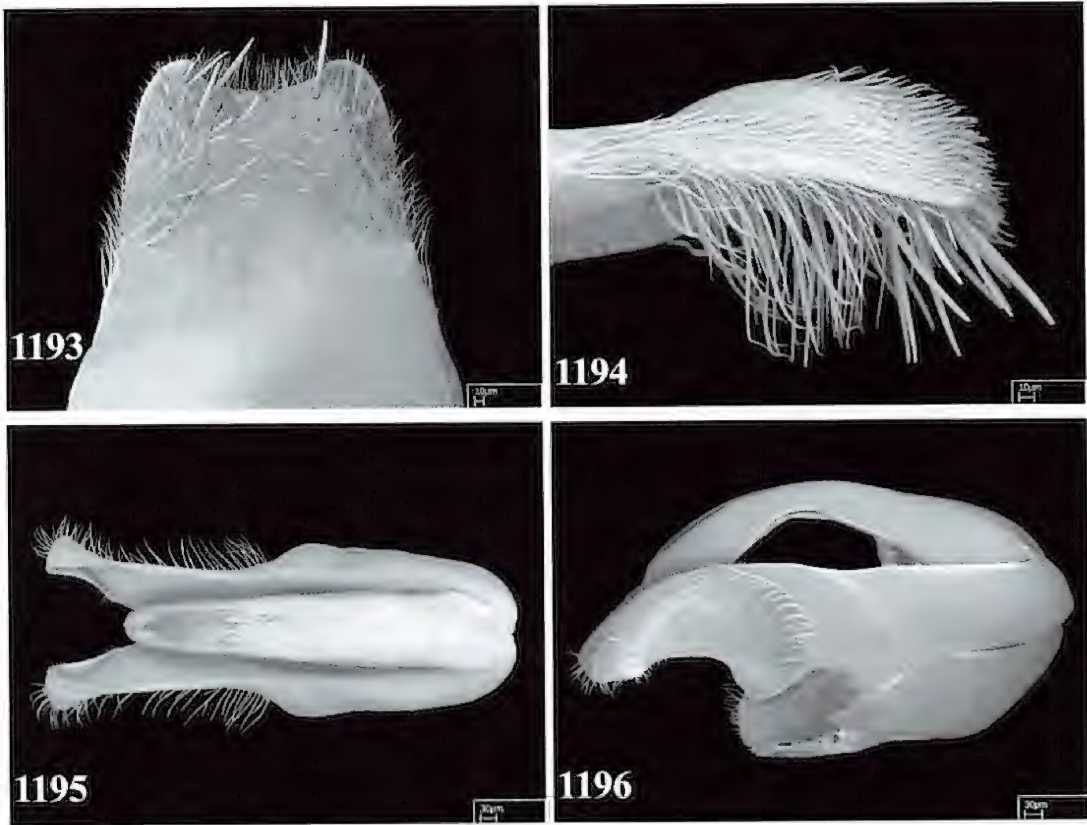
FIGURES 1183-1188. *Pison westwoodii* Shuckard. (1183) Female clypeus and mandibles; (1184) Male clypeus and mandibles, specimen from Australia; (1185) Male clypeus and mandibles, specimen from Papua New Guinea; (1186) Male clypeus and mandibles, specimen from Fiji; (1187) Male clypeus and mandibles, specimen from Hawaii; (1188) Female vertex.





FIGURES 1189-1192. *Pison westwoodii* Shuckard. (1189) Male vertex; (1190) Female mesopleuron; (1191) Male sternum III with swelling undivided; (1192) Male sternum III with swelling divided.

than one diameter apart in female, varying from more than to less than one diameter apart in male. Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron either punctate throughout or impunctate laterally. Scutum not foveate or inconspicuously foveate along flange, but conspicuously foveate in some males from New Guinea, with short longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart to more than one diameter apart (see Geographic Variation below). Tegula not enlarged. Mesopleural punctures ranging from minute, inconspicuous to well-defined (see Geographic Variation below), slightly more than one diameter apart to several diameters apart; interspaces microsculptured, dull except unsculptured in some specimens from Koror Island and some from Pohnpei Island, Pacific Ocean. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits, metapleural punctures microscopically small. Propodeum in most specimens with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent or absent in many specimens); dorsum with ridges varying from conspicuous to evanescent, punctate between ridges; in specimens with evanescent ridges punctures become apparent (only punctures present except basal ridges and median sulcus in some specimens); side ridged, punctate between ridges, but only punctate in many males; posterior surface ridged, punctate between ridges, conspicuously rugose in exceptional specimens. Hindcoxal dorsum with outer margin sharply carinate posteriorly. Punctures of tergum I minute, averaging slightly more than one diameter apart. Sterna punctate throughout.



Figures 1193-1196. *Pison westwoodii* Shuckard, male. (1193) Sternum VIII (ventral surface); (1194) Sternum VIII in profile; (1195) Genitalia in dorsal view; (1196) Genitalia in lateral view.

Setae silvery, shorter than midocellar diameter, inclined obliquely ventrally between midocellus and dorsal end of midfrontal carina, appressed on scutum and tergum I; suberect, up to about  $0.7 \times$  midocellar diameter on lower gena; not concealing integument on clypeus in female, partly concealing in male. Apical depressions of terga with inconspicuous, silvery, setal fasciae.

Body all black except mandible dark ferruginous mesally.

♀.— Upper interocular distance equal to  $0.48-0.54 \times$  lower interocular distance; ocellocular distance equal to  $0.1-0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $0.4-1.1 \times$  hindocellar diameter; eye height equal to  $1.06-1.10 \times$  distance between eye notches. Free margin of clypeal lamella rounded (Fig. 1183), obtusely angulate in some specimens. Dorsal length of flagellomere I  $2.2-2.6 \times$  apical width, of flagellomere IX  $1.2-1.3 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 6.5-8.1 mm; head width 1.9-2.3 mm.

♂.— Upper interocular distance equal to  $0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.3-0.6 \times$  hindocellar diameter (Fig. 1189), distance between hindocelli equal to  $0.7-0.9 \times$  hindocellar diameter; eye height equal to  $1.12-1.40 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate to rounded (see Geographic Variation below). Dorsal length of flagellomere I  $2.5-2.7 \times$  apical width, of flagellomere X  $1.2-1.3 \times$  apical width. Sternum III mesally in the overwhelming majority of specimens (also sternum IV in some specimens) with sparsely punctate, transverse swelling (Fig. 1191) slightly behind midlength (see below for details); swelling divided mesally in many specimens (Fig. 1191), reduced to median tubercle in some



others, forming longitudinal projection in specimens from Sulawesi, and lacking altogether in some rare specimens (see below for details). Sternum VIII broadly emarginate apically (Fig. 1193), in lateral view: Fig. 1194. Genitalia: Figs. 1195, 1196. Length 6.0-8.3 mm; head width 1.6-2.2 mm.

**MALE STERNUM III.** – The vast majority of males has a transverse swelling mesally on sternum III (Figs. 1191, 1192), but the swelling lacks altogether in some specimens. These two forms are otherwise identical, both externally and in the shape of their genitalia, and some of them were collected in mixed populations. For these reasons I treat them as conspecific. The following specimens have no sternal swelling:

In Australia, one from 4 km W Orford, Tasmania.

Two of the five males from Saipan Islands, Marianas.

The only male from Vanuatu.

The only male from Singkor, Malaysia.

All males from New Caledonia.

The three males examined from Philippines.

**GEOGRAPHIC VARIATION.**– Singapore, Borneo: Scutal punctures more than one diameter apart; mesopleuron microsculptured, but less so than in Australian populations, punctures well defined. Male: clypeal lamella about rectangular, rounded apically.

Australia: Scutal punctures about one diameter apart in most specimens, less than one diameter apart in some; mesopleuron conspicuously microsculptured (but only slightly so in some specimens), punctures minute, ill defined in most specimens, but somewhat larger, well defined in those from Bowling Green Bay National Park, 9 and 18 km S Dingo Beach, and Split Rock, Queensland, some from Emerald and Homevale National Park, Queensland, and in those from Kalumburu Mission area, Mining Camp, and Lone Dingo, Western Australia. Male: clypeal lamella acutely angulate to rectangular (Fig. 1184).

New Guinea: Scutal punctures more than one diameter apart in most specimens, but about one diameter apart in some; mesopleuron microsculptured, but less so than in the Australian populations, punctures well defined. Male clypeal lamella obtusely angulate (Fig. 1185), prominently rounded in some specimens.

New Caledonia: Male clypeal lamella varying from acutely angulate to obtusely angulate.

American Samoa: Male clypeal lamella roundly angulate in one specimen examined.

Fiji: Scutal punctures about one diameter apart; mesopleuron slightly microsculptured, punctures well defined. Male: clypeal lamella prominently rounded (Fig. 1186).

Cooks Islands: As above, but clypeal lamella of male obtusely angulate.

Hawaiian Islands: As above, but clypeal lamella of male short, rounded (Fig. 1187).

Pitcairn Island: As above, male unknown.

**NESTING HABITS.**– According to Williams (1927), this species (as *P. iridipennis*) “is common about Honolulu, Hawaii and has been found nesting in the old twig tips of the Night-Blooming *Cereus*” (i.e., *Hylocereus undatus* Britton and Rose). Evans, Matthews, and Hook (1981) described three nests of *P. westwoodii*, all established in artificial nest in Canberra, A.C.T. area. The nests contained three, four and seven cell, respectively, ranging from 6.5 to 14 mm in length, separated by mud partitions 1-2 mm thick. One of the nests had an empty vestibular cell that was closed off by a thick mud plug. Another nest contained in two cells many tiny spiderlings, ranging 19 and 30 per cell. The authors also observed two specimens that emerged from a nest of *P. rufipes* and commented that their mother had probably appropriated cells in a nest constructed by *P. rufipes*, as *P. westwoodii* is known to occupy hollow cavities.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1197).– Singapore, Indonesia, Thailand, Philippines, New Guinea, Australia, Solomon Islands, Caroline Islands, Mariana Islands, Marshall Islands, Fiji,

Samoa, American Samoa, French Polynesia, Cook Islands, Hawaiian Islands, Pitcairn Islands; from sea level up to 2,500 m in Papua New Guinea.

**RECORDS.—AMERICAN SAMOA:**

**Tutuila:** Aunuu Island (1 ♀, BISH), Fagasa Trail (1 ♀, BISH), Leone-Aluau Trail (1 ♀, BISH), Pago Pago (1 ♀, BISH), Taputimu (1 ♂, BISH), Vailoatai (1 ♀, 1 ♂, BISH), Vaitogi (1 ♀, BISH), no specific locality (Giffard, 1919, as *iridipennis*).

**AUSTRALIA: Australian Capital Territory:**

Black Mountain at 35°16'S 146°06'E (5 ♀, 1 ♂, ANIC; 2 ♀, 1 ♂, CAS), Blundells (1 ♂, ANIC), Canberra (14 ♀, 6 ♂, ANIC), Cotter River at Bendora Creek (4 ♀, CAS), Tidbinbilla Nature Reserve (1 ♀, AMS). **Christmas Island:** no specific locality (2 ♀, BISH). **New South Wales:** Barrington House via Salisbury (1 ♀, QMB), Boonoo Boonoo National Park (1 ♀, AMS), Burrendong Botanic Garden at 32°42.1'S 149°06.2'E (2 ♂, CAS), Clarence (1 ♀, 2 ♂, AMS), 119 km W Cobar at 31°33.5'S 144°37.6'E (1 ♀, CAS), Congo 8 km ESE Moruya at 35°58'S 150°09'E (9 ♀, ANIC), Cocumbac Island Nature Reserve near Taree (1 ♀, ANIC), Coolbaggie Forest Reserve 10 km E Eumungerie at 31°58.5'S 148°40.5'E (9 ♀, CAS), Doyles River 50 km NW Taree at 31°31'S 152°14'E (3 ♀, AMS), 1 km W Eumungerie at 31°56.7'S 148°36.9'E (5 ♀, 1 ♂, CAS), Forbes (1 ♀, SAM), Gibraltar Range National Park (1 ♂, ANIC), Gilgandra Flora Reserve at 31°39.7'S 148°46.3'E (1 ♂, CAS), 13 km NW Harden (3 ♀, 3 ♂, ANIC), Jervis Bay: Hyam's Beach (1 ♀, ANIC), Kamay Botany National Park 14 km S center of Sydney at 34°00.3'S 151°13.2'E (3 ♀, CAS), Kiandra: Alpine Creek (1 ♀, ANIC), Kinchega National Park at 32°23.7'S 142°22.7'E (4 ♀, 7 ♂, CAS), Kosciuszko National Park: Olgives Creek near Round Mountain (1 ♂, CAS), Lake George Cullerin (1 ♀, 1 ♂, UCD), Lansdowne near Taree (1 ♀, AMS), 3 km N Lansdowne near Taree (1 ♀, ANIC), 0.5 km SE Lansdowne near Taree (1 ♀, AMS; 1 ♀, ANIC), Lindfield at 33°46'S 151°11'E (4 ♀, 1 ♂, ANIC), Little River in Blue Mountains (2 ♂, AMS), Lord Howe Island: ca 500 m NW Mutton (1 ♀, AMS), Lord Howe Island: Research Station backyard at 31°31'37"S 159°03'58"E (8 ♀, 5 ♂, AMS), Lorient Wildlife Refuge 3 km N and ca 1 km NNW Lansdowne near Taree (2 ♀, AMS), Manly: Kangaroo Park (4 ♀, ANIC), Mount Banks in Blue Mountains (1 ♀, AMS), Mount Kaputar National Park (1 ♀, AMS), Mount Tomah (1 ♂, AMS), 16 km N Mudgee (1 ♀, 5 ♂, ANIC), Myall Lakes National Park: Mungo Brush (2 ♂, AMS), New England National Park (1 ♀, CAS), Nowra (1 ♂, BMNH), 47 km W Nyngan at 31°32.8'S 146°42.6'E (1 ♀, CAS), 4 km W Sunny Corner at 33°22.7'S 149°51.6'E (6 ♀, 4 ♂, CAS), Sydney (1 ♀, 1 ♂, AMS; 1 ♀, BMNH), Sydney: Australian Museum (1 ♀, AMS), Sydney: Kangaroo Park (1 ♀, UCD), Sydney: North Ryde (1 ♀, AMS), 23 km SE Tamworth (2 ♀, 1 ♂, ANIC), 50 km NW Taree at 31°31'S 152°14'E (2 ♂, AMS), Tipaminka (1 ♀, AMS), Tooloom Plateau via Urbenville (1 ♀, ANIC), Towra Point Nature Reserve (1 ♀, AMS), Tuglow River: Mount Werong Fire Road (2 ♀, 1 ♂, AMS), Warrenburg National Park (1 ♀, UCD), Warrumbungle National Park at 31°16.9'S 148°59.1'E (3 ♀, 5 ♂, CAS), Warrumbungle National Park: Camp Pincham (6 ♀, ANIC), near Warrumbungle National Park at 31°16.9'S 149°04.8'E (5 ♂, CAS), 12.5 km W Wilcannia at 31°39.7'S 143°26.0'E (1 ♀, CAS), Wollemi National Park (northern edge) at 32°23.4'S 150°24.8'E (13 ♀, CAS). **Norfolk Island:** Highland Guesthouse at 29°02'S 167°57'E (2 ♂, ANIC), Kingston (1 ♀, BISH), Philip Island near Norfolk Island (2 ♀, CAS), Rocky Point Reserve at 29°03'S 167°55'E (1 ♀, 2 ♂, ANIC; 2 ♂, CAS). **Northern Territory:** Berry Springs Park 50 km SE Darwin (1 ♂, NTM), Black Point on Cobourg Peninsula at 11°09'S 132°09'E (1 ♀, ANIC), 4 mi W Coolibah Homestead at 15°34'S 130°54'E (1 ♀, ANIC), Darwin (1 ♀, NTM), Gregory National Park at 16°06.6'S 130°25.7'E (1 ♀, ANIC), Kakadu National Park (2 ♀, CAS), Kakadu National Park: Leichardt Gallery in Deaf Adder Valley (1 ♀, ANIC), Katherine Gorge near Katherine (1 ♀, QMB), Keep River National Park at 16°03'01"S 130°24'07"E (1 ♀, CAS), Mango Plantation at 12°52'S 130°35'E (1 ♀, NTM), 19 km NE Mount Cahill at 12°50'S 132°52'E (1 ♂, ANIC). **Queensland:** Arcadia on Magnetic

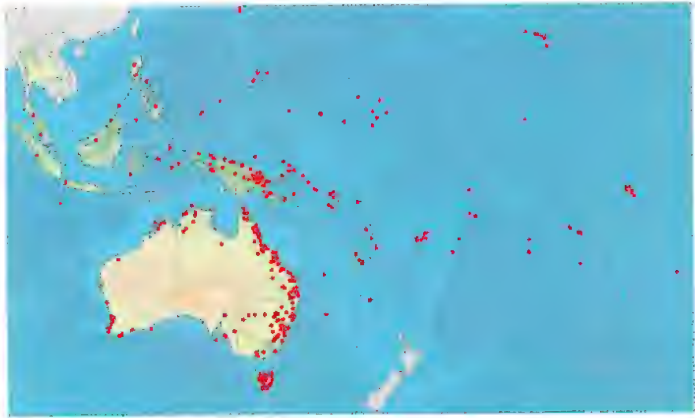


FIGURE 1197. Collecting localities of *Pison westwoodii* Shuckard.



Island at 19°09'S 146°52'E (10 ♀, 3 ♂, ANIC), Armstrong Beach ca 15 km E Sarina at 21°27.3'S 149°17.5'E (1 ♀, 2 ♂, CAS), Atherton at 17°17'S 145°29'E (5 ♀, 3 ♂, ANIC), near Atherton (1 ♀, CAS), 4 km S Ayr at 19°38.2'S 147°23.3'E (1 ♀, CAS), 8 km NW Bald Hill in Ilwraith Range at 13°45'S 143°22'E (1 ♀, ANIC), Batavia Downs at 12°40'S 142°39'E (1 ♂, ANIC), 5 km S Batavia Downs at 12°41'S 142°41'E (2 ♂, ANIC), The Bend 3 km NW Coen 13°56'S 143°12'E (1 ♀, ANIC), Biggenden (1 ♀, ANIC), Bin Bin Range (1 ♀, ANIC), Bluff Range near Biggenden (1 ♀, ANIC), Bowling Green Bay National Park at 19°26.0'S 146°56.7'E (14 ♀, 2 ♂, CAS), Box Creek 16 km N Proserpine (1 ♀, AMS), Brisbane (2 ♂, RMNH; 10 ♀, 1 ♂, QMB), Brisbane : Bardon (1 ♀, 1 ♂, BMNH), Brisbane: Blunder Creek (4 ♀, QMB), Brisbane: Botanic Garden at 27°28.8'S 152°58.1'E (1 ♀, CAS), Brisbane: Indooroopilly (2 ♀, 1 ♂, BMNH), Brisbane: Karawatha Forest at 27°38.6'S 153°04.2'E (4 ♀, CAS), Brisbane: Mount Coot-tha (1 ♀, CAS), Brookfield near Brisbane (8 ♀, BMNH), Bundaberg (1 ♂, ANIC; 1 ♀, 1 ♂, BMNH), Burdekin River 20 km NE Charters Towers at 20°00.1'S 146°26.3'E (2 ♂, CAS), Burnett River at Bundaberg (1 ♀, ANIC), Cairns (1 ♀, 1 ♂, BMNH), Caloundra beach at 26°47.1'S 153°08.4'E (1 ♀, CAS), Carnarvon National Park at 25°04.0'S 148°14.7'E (4 ♀, CAS), Chili Beach near Portland Roads (1 ♀, AMS), Claudie River near Mount Lammont (1 ♀, AMS), Coen at 13°57'S 143°12'E (2 ♀, ANIC), Conway National Park at 20°17.1'S 148°25.8'E (3 ♀, CAS), Cooktown at 15°28.3'S 145°15.5'E (1 ♂, AMS; 1 ♂, CAS), Crater Lakes National Park via Coalstoun Lakes SW Biggenden (2 ♀, 1 ♂, ANIC), Crediton State Forest at 21°11.8'S 148°29.7'E (6 ♀, 2 ♂, CAS) and 21°11.9'S 148°29.9'E (4 ♀, CAS), Curtain Fig 2 km SSW Yungaburra at 17°17'S 145°34'E (1 ♀, ANIC), Davies Creek National Park at 17°00.2'S 145°34.1'E (1 ♂, CAS), 9 km S Dingo Beach at 20°05.5'S 148°30.2'E (2 ♀, CAS), 18 km S Dingo Beach at 20°16.0'S 148°31.2'E (1 ♀, CAS), Dipperu National Park at 21°53.9'S 148°46.5'E (5 ♀, CAS), Edungalba (1 ♀, ANIC), Emerald (3 ♀, ANIC), Eungella National Park at 21°10.5'S 148°30.3'E (61 ♀, 16 ♂, CAS; 7 ♀, 1 ♂, QMB), Eurimbulla National Park at 24°10'S 151°52'E (1 ♂, AMS), Fletcher Creek 43 km NW Charters Towers at 19°48.9'S 146°03.3'E (9 ♀, CAS), Gwinganna 6 km SSW Tallebudgera at 28°11'S 153°23'E (1 ♀, ANIC), Heathlands at 11°45'S 142°35'E (1 ♀, 3 ♂, ANIC), 12 km NE Heathlands at 11°43'S 142°41'E (1 ♀, ANIC), 12 km SSE Heathlands at 11°51'S 142°38'E (6 ♀, ANIC), Homevale National Park at 21°26.9'S 148°32.4'E (14 ♀, 1 ♂, CAS), 14 km NW Hope Valley Mission at 15°16'S 144°59'E (2 ♀, 2 ♂, ANIC), Horse Gully at foot of Bunya Mountains at 26°42'S 150°31'E (1 ♂, ANIC), Iron Range National Park: Middle Cloudie River (4 ♀, AMS), Isaac River 100 km NE Clermont (1 ♀, QMB), Kuranda (1 ♀, ANIC; 1 ♀, CAS), Kuranda: Russet Park (4 ♀, 1 ♂, CAS), 5 km NE Leyburn (2 ♀, CAS), Mackay (6 ♀, 3 ♂, BMNH), Mareeba (1 ♀, ANIC), 65 km N Marlborough (1 ♀, AMS), Maryborough at 25°32'S 152°44'E (1 ♀, ANIC), Mary Creek 14 mi. N Mount Molloy (1 ♀, CAS), 13 km E Miles at 26°40'S 150°19'E (1 ♂, ANIC), Mornish (1 ♀, CAS), Mossman (1 ♀, CAS), 56 road km WNW Mount Carbine at 16°19.4'S 144°43.2'E (1 ♂, CAS), Mount Lewis 3200 feet (1 ♀, CAS), 48 km E Mount Surprise at 18°09.0'S 144°43.6'E (4 ♀, CAS), Mount Tambourine (1 ♂, BMNH), Mount Tibrogargane (1 ♀, QMB), Mount Walsh National Park via Biggenden (1 ♂, ANIC), 3 km NE Mount Webb at 15°03'S 145°09'E (1 ♂, ANIC), Mulgrave River (1 ♀, CAS), Murrays Spring in Lawn Hill National Park at 18°35'15"S 138°04'28"E (1 ♀, ANIC), Musselbrook Camp at 18°36'S 138°08'E (1 ♀, ANIC), Normanby River at 15°18'S 144°57'E (2 ♀, ANIC), Paluma Range National Park at 18°51.6'S 146°07.6'E, alt. 50 m (3 ♀, CAS), Pendland at 20°31.0'S 145°24.2'E (1 ♀, CAS), Pinnacle Creek 27 km N Archer Crossing (1 ♀, ANIC), Port Douglas at 16°31.1'S 145°28.3'E (10 ♀, 3 ♂, CAS), Rainforest CRC [= Cooperative Research Centre] at 16°06'16"S 145°26'58"E (1 ♀, AMNH), Rockhampton (1 ♀, ANIC), 2 km N Rokeby at 13°39'S 142°40'E (4 ♀, 1 ♂, ANIC), 2 km W Rolleston at 24°27.6'S 148°36.2'E (1 ♀, CAS), Shiptons Flat at 15°47'S 145°14'E (7 ♂, ANIC), Somerset Dam (2 ♀, QMB), Split Rock 14 km SE Laura at 15°39'S 144°31'E (89 ♀, 18 ♂, ANIC; 1 ♂, CAS) and at 15°39'S 144°42'E (7 ♀, ANIC), Stanthorpe (1 ♀, QMB), Tannum Sands at 23°56.8'S 151°22.5'E (1 ♂, CAS), Tibrogargan Creek (1 ♂, QMB), Toowoomba (1 ♂, QMB), Townsville (1 ♀, BMNH; 1 ♀, RMNH; 4 ♀, 3 ♂, SAM), 11 km S Townsville at 19°21.8'S 146°53.2'E (5 ♀, 1 ♂, CAS), 37 km S Townsville at 19°22.4'S 147°01.7'E (1 ♀, CAS), Tully (1 ♂, RMNH), 13 km SE Weipa at 12°40'S 143°00'E (4 ♀, 2 ♂, ANIC), Whitsunday Islands (1 ♀, RMNH), Wonga Beach 11 km NNE Mossman at 16°19.9'S 145°25.3'E (1 ♀, 2 ♂, CAS).

**South Australia:** Eckerts Creek at 34°20'S 140°34'E (1 ♀, ANIC), Highgate near Adelaide (1 ♀, SAM), Kangaroo Island: Gosse area (3 ♀, BMNH), Mitcham near Adelaide (4 ♀, SAM), 5 km S Mylor (2 ♂, BMNH), Wilpena in Flinders Ranges National Park at 31°31.7'S 138°36.2'E (27 ♀, 14 ♂, CAS), 3 km ENE Wilpena in Flinders Ranges National Park at 31°31.0'S 138°36.6'E (1 ♀, CAS), Wilpena Pound Gap at 31°33'S

138°36'E (1 ♂, ANIC). **Tasmania:** Bathurst Harbour at 43°22'S 146°08'E (1 ♀, ANIC), 14 km S Bronte Park at 42°15'S 146°29'E (1 ♀, ANIC), 12 km NNE Bronte Park at 42°02'S 146°33'E (1 ♂, ANIC), 9 km SW Bronte Park at 42°12'S 146°30'E (2 ♀, ANIC), Condominium Creek 5 km WSW Mount Anne at 42°58'S 146°22'E (1 ♂, ANIC), 5 km ENE Cranbrook at 41°59'S 148°07'E (1 ♂, ANIC), 9 km WSW Derwent Bridge at 42°10'S 146°08'E (1 ♀, ANIC), 3 km E Dover (1 ♀, CAS), Edwards Road in Hartz Mountains at 43°07'S 146°47'E (2 ♀, ANIC), Ewart Creek at 41°58'S 145°28'E (2 ♀, ANIC), Franklin Road at 42°13'S 146°01'E (3 ♀, ANIC), 7 km S Frodshams at 42°53'S 146°22'E (1 ♂, ANIC), 13 km W Geeveston (1 ♀, BMNH), 1 km SSE Gladstone (1 ♀, 2 ♂, ANIC), 5 km SE Harford at 41°15'S 146°36'E (2 ♂, ANIC), Hellyer Gorge at 41°16'S 145°37'E (6 ♀, ANIC), Hobart (1 ♀, SAM), Hobart: Sandy Bay (1 ♀, ANIC), Intake Bridge at 41°19'S 147°56'E (1 ♀, 1 ♂, ANIC), Launceston (5 ♀, 2 ♂, SAM), Launceston: Newstead (2 ♀, ANIC), The Lea at 42°56'S 147°19'E (1 ♀, ANIC), 9 km SE Miena (3 ♀, UCD), 11 km E Mount Barrow at 41°23'S 147°25'E (1 ♀, ANIC), Mount Field National Park (3 ♀, BMNH), 4 km W Orford at 42°34'S 147°50'E (1 ♂, ANIC; 1 ♂, CAS), Pelion Gap 2 km ENE Mount Ossa at 41°52'S 146°03'E (1 ♀, ANIC), Pelion Hut 3 km S Mount Oakleigh at 41°50'S 146°03'E (8 ♀, 3 ♂, ANIC), Pittwater (1 ♀, ANIC), Poatina at 41°49'S 146°54'E (4 ♀, ANIC), 9 km SW Poatina at 41°48'S 146°52'E (1 ♀, ANIC), Pyengana (1 ♀, SAM), 4 km E Rosebery at 41°47'S 145°35'E (2 ♀, ANIC), Saint Patricks River (2 ♀, SAM), 4 km WSW Tim Shea (1 ♂, ANIC), University of Tasmania Campus at 42°56'S 147°21'E (3 ♀, ANIC), 3 km ENE Wayatinah at 42°22'S 146°29'E (1 ♂, ANIC), 4 km SE Weldborough at 41°14'S 147°56'E (1 ♀, 1 ♂, ANIC), 14 km SSW Wilmot at 41°30'S 146°05'E (1 ♂, ANIC), no specific locality (2 ♀, OXUM, lectotype and paralectotype of *Pison obliquum*). **Victoria:** Balwyn (1 ♀, ANIC), Crib Point at 38°21'47"S 145°12'07"E (1 ♀, WAM), Melbourne: Botanic Garden (1 ♂, BMNH), 23 mi E Orbost (1 ♀, CAS), Thomson State Forest 5 km S Aberfeldy (1 ♂, CAS). **Western Australia:** Applecross at 32°00'50"S 115°50'20"E (1 ♀, WAM), Augusta at 34°18'43"S 115°09'32"E (1 ♀, WAM), Busselton (2 ♀, UCD), Chidlow at 31°51'25"S 116°16'19"E (1 ♀, WAM), Denmark (1 ♀, WAM), Dongarra (1 ♀, BMNH), Fitzgerald River National Park at 33.949416°S 119.926086°E (10 ♀, 1 ♂, MNKB), Graylands (1 ♂, WAM), 12 km S Kalumburu Mission at 14°25'S 126°38'E (1 ♂, ANIC), 14 km SE Kalumburu Mission at 14°25'S 126°40'E (2 ♀, ANIC), 4 km W King Cascade at 15°38'S 125°15'E (1 ♂, ANIC), Lone Dingo on Mitchell Plateau at 14°35'S 125°45'E (1 ♀, ANIC), Millstream (1 ♂, ANIC), Mining Camp on Mitchell Plateau at 14°49'S 125°50'E (1 ♀, ANIC), Perth (1 ♀, BMNH), Perth: Cottesloe (8 ♀, 2 ♂, WAM), Perth: Darling Range (5 ♀, BMNH), Perth: Darlington at 31°54'04"S 116°04'52"E (1 ♀, WAM), Perth: Maylands (8 ♀, 3 ♂, WAM), 100 km WSW Point Malcolm at 33°48'S 123°46'E (2 ♀, 1 ♂, WAM), Porongorup National Park (1 ♀, CAS), Serpentine Falls National Park at 32°22.1'S 116°00.5'E (1 ♀, CAS), South Dandalup Dam 17 km E North Dandalup at 32°38.7'S 116°02.4'E (4 ♂, CAS), South Perth (1 ♀, WAM), Stokes National Park 66 km W Esperance at 33°49.8'S 121°08.4'E (1 ♂, CAS), Yalgrope National Park at 32°54.8'S 115°42.1'E (1 ♀, CAS), Yallingup (1 ♂, UCD), Yanchep 32 mi N Perth (10 ♀, 2 ♂, BMNH).

**COOK ISLANDS:** **Island of Aitutaki:** Aitutaki (1 ♂, BISH), Amuri (2 ♂, BISH), no specific locality (3 ♀, BISH). **Island of Rarotonga:** Arorangi at 21°12.4'S 159°49.4'W (1 ♀, 1 ♂, CAS), Titikaveka (1 ♀, 1 ♂, BISH), no specific locality (1 ♀, BMNH).

**FEDERATED STATES OF MICRONESIA** (Krombein, 1949b or as indicated): **Dublon Island:** Truk Atoll: Truk and Truk-Erin (Yasumatsu, 1953), Truk: Moen (1 ♀, CAS). **Kosrae Island** (formerly Kusaie Island): Lelo and Mwot-Utwe (Yasumatsu, 1953), Mount Tafeyät, Mutunlik (7 ♀, BISH). **Palau:** Peleliu Island. **Pohnpei Island** (formerly Ponape): Kolonia (5 ♀, BISH), Metalanum (1 ♀, BISH), Nanponmal (1 ♀, BISH), Ronkiti-One (Yasumatsu, 1953), Tamon. **Yap Island:** no specific locality (1 ♀, BISH).

**Fiji:** **Cicia:** Mabula (1 ♂, BISH). **Ovalau:** Levuka (1 ♀, 1 ♂, BISH). **Vanua Balavu:** Nabavatu (1 ♂, BISH). **Vanua Levu:** Savusavu Estate (4 ♂, CAS). **Viti Levu:** Korotogo 8 km E Sigatoka (1 ♀, CAS), Nadi (1 ♀, BISH), 10 km E Sigatoka (1 ♀, 4 ♂, CAS), Suva (2 ♀, CAS; 10 ♀, 3 ♂, RMNH).

**FRENCH POLYNESIA** (Cheesman, 1928; Williams, 1932, or as indicated): **Moorea:** Atitia (4 ♂, CAS), Baie de Cook (2 ♀, BISH). **Marquesas Islands:** Fatu-hiva: Hiva-oo: Atuona Valley; Nuku-hiva: Teivipakeka; Tahuata: Kiinui Valley; Ua-huka: Hane Valley; Ua-pou: Hakahetau. **Society Islands:** Raiatea: Uturoa (2 ♀, BISH), Vaitape (1 ♀, 1 ♂, BISH). **Tahiti:** between Lake Vaihiria and Otiaoroa road (Menke, 1979), Tairapu. **Tubuai Island:** Mahu (2 ♀, BISH).

**HAWAIIAN ISLANDS:** **Hawaii:** Kapua Bay (1 ♀, BISH). **Maui:** Haiku (9 ♀, BISH), Makena (3 ♀, BISH). **Molokai** (Krauss, 1944): Molokai, south central Molokai. **Niihau:** no specific locality (1 ♀, BISH). **Oahu:**



Halona Valley at 21°25'N 158°06'W (1 ♂, CAS), Honolulu: Ewa (2 ♂, BISH; 1 ♀, 1 ♂, CAS), Honolulu (2 ♀, BISH; 1 ♂, BMNH, lectotype of *Pison iridipenne*; 1 ♀, UCD), Honolulu: Nuuanu Valley (1 ♀, CAS), Honolulu: Punchbowl (1 ♂, CAS), Honolulu: Woodlawn (1 ♀, 2 ♂, CAS), Manoa (1 ♀, BISH), Mount Tantalus (1 ♀, BISH), Waipio (1 ♂, BISH).

**INDONESIA:** **Ambon:** no specific locality (5 ♀, RMNH). **Halmahera:** between Payahe and Gita Woda (2 ♂, RMNH), Sagutara 20 km S Payahe (1 ♂, RMNH). **Java:** Bogor (1 ♀, RMNH), Jakarta (2 ♀, 1 ♂, as Batavia, RMNH). **Seram:** 11 km E Wahai (1 ♀, RMNH). **Sula:** island of Mangoli: near Buya (1 ♂, RMNH), island of Taliabu: near Semuya (1 ♂, RMNH). **Sulawesi:** Mount Bulusaraung: near Camba Malawa (1 ♂, RMNH). **Sumatra:** western Sumatra: no specific locality. **Western Papua (= Indonesian New Guinea):** Island of Biak: Bosnik at 1°09'S 136°14'E (1 ♂, RMNH), Kampong Landbouw (1 ♀, BISH), and Sorido (1 ♀, AMNH), Ifar (1 ♀, RMNH), Island of Yapen: Davai River SSE Sumberbaba (1 ♀, 1 ♂, BISH, as Japen), Jayapura (14 ♀, 3 ♂, RMNH, as Hollandia), Karubaka in Swart Valley at 3°36'S 138°28'E (2 ♀, BISH), Kebar Valley W Manokwari (1 ♀, BISH), Maffin Bay (1 ♀, 2 ♂, CAS), Mimika River (1 ♀, BMNH, holotype of *Pison impunctatum*), Mount Gyifrie (1 ♀, SAM), Paniai Lakes (as Wisselmeren): Enarotadi (2 ♀, BISH), Moanemani (1 ♀, BISH) and Urupura (1 ♀, BISH), Sentani at 2°40'S 140°30'E (2 ♂, RMNH), Sibil Valley in Star Mountains at 5°00'S 141°00'E (1 ♀, BISH), mouth of Tor River 4 km E Hol Maffen (1 ♀, 2 ♂, BISH).

**JAPAN:** **Ogasawara (= Bonin) Islands:** Chichijima Island: Sakai-ura (1 ♂, BISH), Hahajima Island (1 ♀, BISH).

**KIRIBATI REPUBLIC:** Teraina Island (1 ♂, BISH, as Washington Island).

**MALAYSIA:** **Sabah:** near Penampang (2 ♂, CAS), Ranau (2 ♀, BISH), Singkor (1 ♂, BISH). **Sarawak:** Meirai in Kapit District (1 ♀, BISH). **Selangor:** Dusun Tua in Hulu Langat area (1 ♀, RMNH, as Ulu Langat).

**MARIANA ISLANDS** (Krombein, 1949b or as indicated): **Guam:** Ritidian Point (2 ♂, BISH), no specific locality (1 ♂, BISH). **Saipan:** Saipan Island (5 ♂, BISH), Tanapag (Krombein, 1950). **Tinian Island:** Hagoi Lake, Marpo Valley, Mount Lasso.

**MARSHALL ISLANDS:** Ailinglaplap Atoll: Bigatyelang Island (12 ♀, BISH), Arno Atoll: Ine Island (3 ♀, 2 ♂, BISH), Ebon Island (3 ♀, BISH), Jaluit Atoll (Yasumatsu, 1953), Wotho Atoll (25 ♀, 2 ♂, BISH), Wotje Atoll (1 ♂, BISH).

**NEW CALEDONIA:** **Grande Terre:** Anse Vata (1 ♂, BISH), Mont Koghi (1 ♀, BISH), Nouméa (2 ♀, ANIC; 7 ♀, 6 ♂, BISH), Oua Tom (1 ♂, BISH), Saint Louis, a part of Mont Doré village (2 ♂, BISH), Thio River valley (1 ♀, BISH), Touho-Houailou (1 ♀, BISH).

**PALAU REPUBLIC:** Koror Island (13 ♀, 7 ♂, BISH; 1 ♀, ELKU, holotype of *Pison korrorensis*; 1 ♂, USNM).

**PAPUA NEW GUINEA:** **Central Province:** Bome in Goilala District (2 ♀, BISH), Rouna Falls 46 km E Port Moresby (1 ♀, BISH). **Eastern Highlands Province:** Aiyura (1 ♂, BISH), Kainantu (1 ♀, BISH), Kassam 48 km E Kainantu (1 ♀, 1 ♂, BISH), 22 km SE Okapa (1 ♀, BISH). **East Sepik Province:** Angoram (1 ♀, BISH). **Island of Bougainville:** Buin (1 ♀, BISH), Buka (1 ♀, BISH). **Madang Province:** Aranam 2 air km W Bundi at 5°45'S 145°15'E (3 ♀, 12 ♂, CAS), Baiteta 12 km NW Alexishafen at 5°00'S 145°45'E (3 ♀, 1 ♂, CAS), Batua 2 air km SW Bundi at 5°45'S 145°15'E (4 ♀, CAS), Brahman Catholic Mission at 6°45'S 145°23'E (1 ♂, CAS), Bundi at 5°45'S 145°15'E (36 ♀, 41 ♂, CAS), Erima (1 ♀, MTM, determined *P. iridipenne* by Tsuneki), Gogol River 12 km SW Madang at 5°20'S 145°42'E (1 ♀, CAS), Karisokora 7.5 km W Bundi at 5°44'S 145°10'E (1 ♀, CAS), Karkar Island: Bagiai Crater Trail (1 ♀, BISH) and Kevasop village (2 ♀, CAS), 5 air km NE Mundiai Pass at 5°46'S 145°09'E, alt. 2,500 m (1 ♀, CAS), Nagada Harbor 8 km N Madang at 5°09'S 145°48'E (2 ♀, 10 ♂, CAS), Nobonob Hill 7 km NW Madang at 5°10'S 145°45'S (11 ♀, 14 ♂, CAS), Pandambai 6 air km W Bundi at 5°38'S 145°11'E, 2,330 m. alt. (5 ♀, CAS), Saidor: Kiambavi (1 ♀, BISH), Sapi Forest Reserve 30 km W Madang at 5°12'S 145°30'E (1 ♂, AMNH; 25 ♀, 58 ♂, CAS), Simbai at 5°17'S 144°26'E (1 ♀, AMNH; 16 ♀, 31 ♂, CAS), Snow Pass at 5°44'S 145°18'E (1 ♀, CAS), Tapo Creek 26 km SW Madang at 5°24'S 145°38'E (3 ♀, 2 ♂, CAS) Wanuma (1 ♀, BISH). **Milne Bay Province:** Normanby Island: Wakaiuna (1 ♀, BISH), Woodlark Island: Kulumadau Hill (1 ♀, BISH). **Morobe Province:** Busu River near Lae (1 ♀, BISH), Finschhafen (2 ♀, BISH), Mindik (1 ♂, BISH), Mount Kaindi, 2,440 m (1 ♂, BISH; 1 ♀, CAS), Mount Missim at 7°15'S 146°48'E (1 ♀, 1 ♂, BISH), Pindiu (1 ♀, BISH), Wau (44 ♀, 22 ♂, BISH; 2 ♀, 1 ♂, RMNH), Wau: Edie Creek (1 ♀, BISH), Wau: Kunai Creek (1 ♀, BISH).

**National Capital District:** Port Moresby (1 ♂, BISH; 3 ♀, 1 ♂, CAS). **New Britain** (Tsuneki, 1982, or as indicated): Hermit Islands: Luf, Keravat (1 ♀, BISH), Valoka, Yalom. **New Ireland:** Hans Meyer Range (1 ♀, AMS), Lemkamin (Tsuneki, 1982), Kavieng (1 ♀, 1 ♂, BISH). **Oro Province:** Kokoda (1 ♀, BMNH), Popondetta (1 ♀, BISH). **Sandaun Province** (= West Sepik): island of Seleu (1 ♂, MTM, determined *P. iridipenne* by Tsuneki), Torricelli Mountains (1 ♀, UCD). **Southern Highlands Province:** Dimifa (1 ♀, BISH), Koroba 40 km W Tari (2 ♀, BISH). **Western Highlands Province:** Nondugl (1 ♀, BISH).

**PHILIPPINES:** **Luzon:** Buguias 60 km S Bontoc (2 ♀, BISH), Pili on Mount Isarog (1 ♂, BISH), Wawa Dam (1 ♀, 1 ♂, BISH). **Mindanao:** Jolo Island: 8-10 km S Taglibi (1 ♀, BISH), Mount Pamalihi 21 km W Gingoog (2 ♀, 1 ♂, BISH). **Palawan:** Pinigisan (Tsuneki, 1976).

**PITCAIRN ISLANDS:** Pitcairn Island (1 ♀, CAS).

**SAMOA:** **Upolu:** Mount Vaea (1 ♀, BISH), no specific locality (1 ♀, RMNH).

**SINGAPORE:** Singapore (1 ♀, 2 ♂, CAS).

**SOLOMON ISLANDS:** **Bellona:** western end (1 ♀, BISH). **Guadalcanal:** Paripao (1 ♀, BISH). **Kolombangara:** Pepele (1 ♀, BISH). **Malaita:** Tagatalau (1 ♀, BISH). **New Georgia:** Munda (1 ♂, BISH). **Rennell:** Te-Uhunhango (1 ♂, BISH). **Santa Cruz:** Graciosa Bay (1 ♀, BISH). **Tulagi:** Chinatown (4 ♀, RMNH), locality illegible (1 ♀, RMNH), no specific locality (1 ♀, 1 ♂, RMNH).

**THAILAND:** Ton Nga Chang National Park 27 km SW Hat Yai at 6°54'N 100°21'E (2 ♀, RMNH).

**TOKELAU ISLANDS:** (Hinckley, 1969, as *P. iridipenne*).

**TONGA:** **Tongatapu:** Nuku'alofa (1 ♀, BISH), locality unknown (1 ♀, BISH). **Vavau:** Neiafu (1 ♀, BISH).

**VANUATU:** **Efate:** Port Vila (2 ♀, 1 ♂, BISH). **Malekula:** Lakotoro (2 ♀, BISH). **Tanna:** Lenakel (1 ♀, BISH).

### *Pison woji* Menke

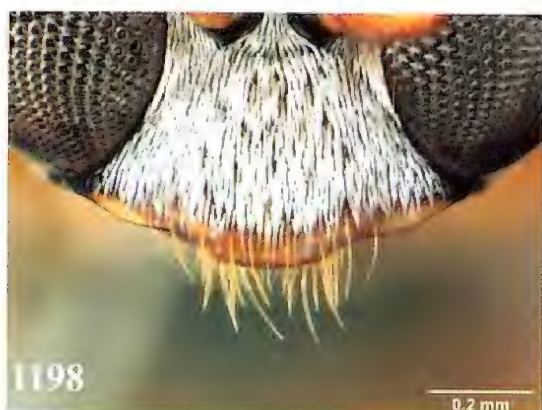
Figures 1198-1203.

*Pison woji* Menke, 1988:92, ♀. Holotype: ♀, Papua New Guinea: Western Highland Province: Bayier River (AEI), paratype examined.

**RECOGNITION.**— *Pison woji* is one of the species in which the second recurrent vein joins the second submarginal cell at the middle of the latter's length. It differs from all other *Pison* except the New Guinean species *P. pistillum* by its unusually long first gastral segment (Fig. 1201), although *P. difficile* and *P. icarioides* approach this condition: the length of tergum I is 1.6-1.7 × the apical width, the distance between the gastropodeal articulation and the spiracle 2.1-2.2 × the distance between the spiracles. As in *P. exultans*, the midfrontal supraantennal carina is replaced by a fine sulcus. As in *P. pistillum*, the ommatidia are markedly larger in the lower half of the eye than those in the dorsal half (Fig. 1199). See the latter species for differences.

**DESCRIPTION.**— Head subspherical in dorsal view (Fig. 1200). Frons swollen, dull, minutely punctate, punctures about one diameter apart; middle supraantennal carina replaced by fine sulcus. Distance between antennal socket and orbit smaller than half socket width. Gena narrow in dorsal view (Fig. 1200). Labrum emarginate. Ommatidia markedly larger in lower half of eye than those in dorsal half (Fig. 1199). Anteromedian pronotal pit transversely elongate, twice as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging about one diameter apart; interspaces microsculptured. Tegula somewhat enlarged. Mesopleural punctures minute, averaging about 2 diameters apart. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely punctate, also obliquely ridged basomedially; side finely punctate; posterior surface finely punctate, finely ridged laterally. Forewing with three submarginal cells; second recurrent vein received by second submarginal cell II near its midlength. Posteroventral forefemoral surface





FIGURES 1198-1202. *Pison woji* Menke, female. (1198) Clypeus; (1199) Head in frontal view; (1200) Head in dorsal view; (1201) Tergum I in dorsal view; (1202) Body in lateral view.

microscopically punctate, punctures several diameters apart. Hindcoxal dorsum with outer margin not carinate. Gastral segment I narrow in basal half, broadened in apical half, transversely impressed preapically, conspicuously elongate (Fig. 1201); length of tergum I  $1.6-1.7 \times$  apical width, distance between gastropodeal articulation and spiracle  $2.1-2.2 \times$  distance between spiracles; punctures of preapical part microscopic, about one diameter apart. Sternum II minutely punctate throughout.

Setae silvery, appressed on thorax, forecoxal venter, femoral venters, and tergum I; on frons ill defined and oriented obliquely dorsally; completely concealing integument on clypeus. Apical depressions of terga I-IV with ill-defined, silvery, setal fasciae.

Head, thorax, and propodeum black, clypeus light brown next to lobe free margin; mandible yellowish, dark apically; antenna ferruginous, apical flagellomeres dark dorsally. Femora, tibiae, and tarsi ferruginous, apex of fore- and midtarsi ferruginous or yellowish, hindtarsal apex dark brown; hindtibial spurs whitish. Gaster black, segment I ferruginous.



♀ (Fig. 1202).— Upper interocular distance equal to  $1.05\text{--}1.10 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6\text{--}0.8 \times$  hindocellar diameter; eye height equal to  $1.02\text{--}1.04 \times$  distance between eye notches. Middle clypeal lobe barely protruding beyond lateral section, free margin of lamella shallowly concave on each side (Fig. 1198). Dorsal length of flagellomere I  $1.8\text{--}1.9 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with minute incision shortly beyond midlength. Length 5.4–6.5 mm; head width 1.3–1.5 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1203).— Northern Queensland, Papua New Guinea.

**RECORDS.**— **AUSTRALIA: Queensland:** 11 km NW Bald Hill in McIlwraith Range at  $13^{\circ}44'S$   $143^{\circ}20'E$  (1 ♀, ANIC), 12 km SSE Heathlands at  $11^{\circ}51'S$   $142^{\circ}38'E$  (10 ♀, ANIC; 5 ♀, CAS).

**PAPUA NEW GUINEA: Madang Province:** Baiteta 12 km NW Alexishafen at  $5^{\circ}00'S$   $145^{\circ}45'E$  (2 ♀, CAS). **Sandaun (= West Sepik) Province:** Sugoite in Torricelli Mountains (1 ♀, BISH). **Western Highlands Province:** Baiyer River (1 ♀, CAS, paratype of *Pison woji*).



FIGURE 1203. Collecting localities of *Pison woji* Menke.

***Pison xanthognathos* Pulawski, species nova**

Figures 1204–1214.

**NAME DERIVATION.**— *Xanthognathos* derives from two Greek words: ξανθός, *yellow*, and γνάθος, *a jaw, mandible*, a noun in apposition to the generic name; with reference to the pale yellow mandible in the male of this species.

**RECOGNITION.**— *Pison xanthognathos* has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein or nearly so, tegula partly impunctate and asetose, and setae appressed on tergum I. The body is all black, but the setal fasciae on the apical depressions of terga are golden (Fig. 1209). Other characters include: middle clypeal lobe well defined, gena punctate and setose on each side of oral fossa, with setae sinuous, at least as long as midocellar diameter, mesopleural punctures contiguous, and propodeal dorsum closely punctate, with interspaces merging into fine, inconspicuous ridges. One important recognition feature is the longitudinal propodeal carina separating the dorsum and posterior surface from the side that in many specimens is evanescent or fully replaced by a series of short, transverse ridges (ridges evanescent in some specimens).

The female can be recognized by the following combination: punctures less than one diameter apart on upper frons and scutum, ocellocular distance equal to  $1.3\text{--}1.7 \times$  hindocellar diameter, clypeal surface not concave above lamella (which is longer mesally than laterally), hypostomal carina not expanded, and sterna II–IV punctate throughout.

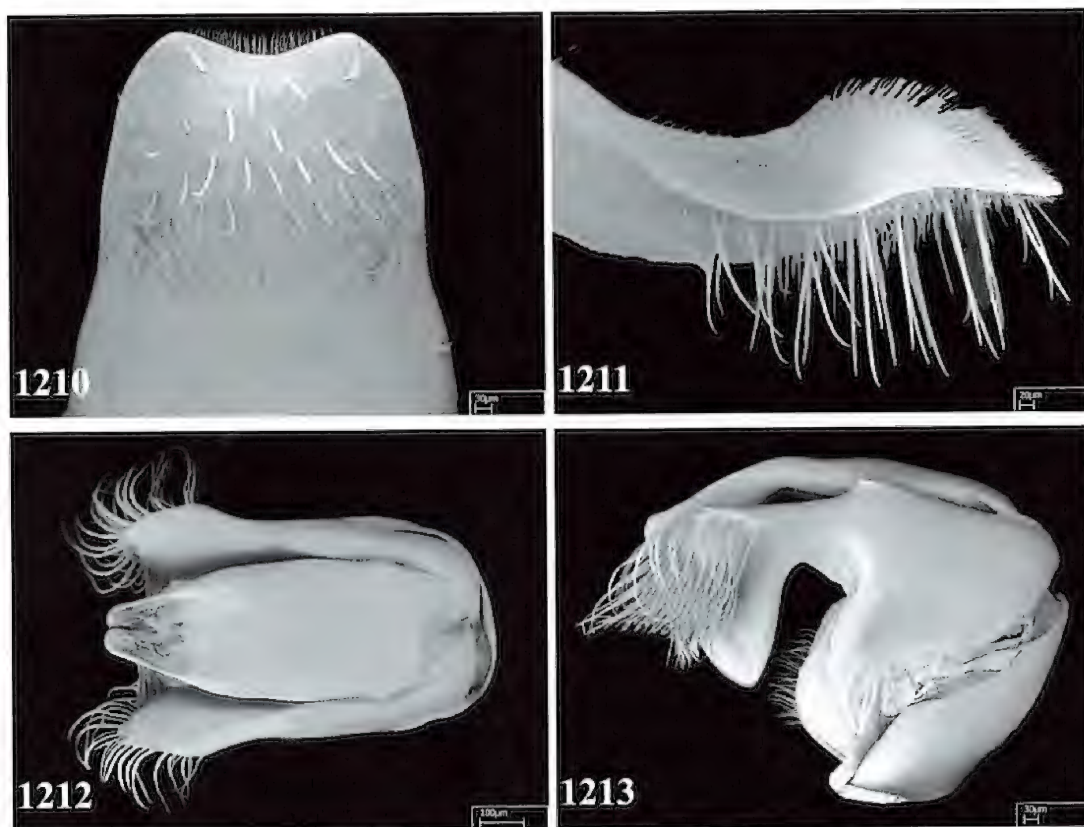
In the male, flagellomeres II–VII are slightly convex ventrally (Fig. 1207), flagellomeres III–X have narrow, shiny tyloids ventrally (Fig. 1208), and in the vast majority of specimens the mandible is pale yellow (largely so in most specimens, but only narrowly so at the basal third in some individuals, and exceptionally all black). Also, in most specimens the hypostomal carina is broadened next to the mandibular end (Fig. 1206).

**DESCRIPTION.**— Frons dull, minutely punctate, punctures less than one diameter apart. Labrum slightly emarginate. Anteromedian pronotal pit transversely elongate, slightly longer than half





FIGURES 1204-1209. *Pison xanthognathos* Pulawski, sp. nov. (1204) Female clypeus and mandibles; (1205) Male clypeus and mandibles; (1206) Posterior surface of male head (arrow shows broadened part of hypostomal carina); (1207) Male flagellomeres III-VI; (1208) Flagellomeres III-X of male in ventral view showing tyloids; (1209) Female gaster in dorsal view.



FIGURES 1210-1213. *Pison xanthognathos* Pulawski, sp. nov., male. (1210) Sternum VIII (ventral surface); (1211) Sternum VIII in profile; (1212) Genitalia in dorsal view; (1213) Genitalia in lateral view.

midocellar diameter. Propleuron varying: either all densely punctate or sparsely punctate anteriorly. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures minute, less than one diameter apart. Tegula somewhat enlarged. Mesopleural punctures contiguous. Postspiracular carina evanescent. Metapleural sulcus costulate or not costulate between dorsal and ventral metapleural pits. Propodeum in most specimens with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle, but in many cases carina evanescent or fully replaced by row of short transversal ridges (ridges evanescent in some specimens); dorsum with short transverse carinae emerging from middle carina, remaining dorsum and side finely, closely punctate (interspaces merging into minute, inconspicuous ridges); side closely punctate, interspaces merging into fine ridges; posterior surface ridged, punctate between ridges, or only closely punctate in dorsal half. Punctures of tergum I fine, more than one diameter apart on anterior slope, but less than one diameter apart posteriorly.

Setae silvery on head and side and venter of thorax, brownish on scutum and propodeal dorsum, silvery on tergum I basally, golden on remaining gaster (Fig. 1209); forming setal fasciae on tergal apical depressions; erect on upper frons and scutum (in addition to appressed setae), appressed on femoral venters and tergum I; appressed setae oriented dorsolaterad between dorsal end of midfrontal carina and midocellus; on lower gena sinuous, about as long as midocellar diameter in specimens from New South Wales and South Australia, longer than that in specimens from



Western Australia; partly concealing integument on clypeus in female, completely so (except lamella) in male. Sterna punctate throughout.

Body all black, apical tarsomeres brown; female mandible ferruginous mesally, male mandible pale yellow (largely so in most specimens, but only narrowly at basal third in some specimens, and all black in specimen from 79 km NNW Renmark, South Australia).

♀.— Upper interocular distance equal to  $0.86\text{--}0.88 \times$  lower interocular distance; ocellular distance equal to  $1.3\text{--}1.7 \times$  hindocellar diameter, distance between hindocelli equal to  $1.1\text{--}1.3 \times$  hindocellar diameter; eye height equal to  $0.90\text{--}0.92 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 1204). Dorsal length of flagellomere I  $2.1\text{--}2.2 \times$  apical width, of flagellomere IX  $1.1\text{--}1.4 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 10.4–12.3 mm; head width 2.8–3.2 mm.

♂.— Upper interocular distance equal to  $0.84\text{--}0.92 \times$  lower interocular distance; ocellular distance equal to  $1.4\text{--}1.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2\text{--}1.4 \times$  hindocellar diameter; eye height equal to  $0.94\text{--}1.12 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate (Fig. 1205). Flagellomeres III–X with shiny tyloids that do not extend to flagellomere apex (Fig. 1208), flagellomeres II–VII slightly convex ventrally (Fig. 1207). Dorsal length of flagellomere I  $1.7\text{--}1.9 \times$  apical width, of flagellomere X  $0.9\text{--}1.1 \times$  apical width. Hypostomal carina somewhat expanded next to anterior end in vast majority of specimens (Fig. 1206). Tergum VII in many specimens with thin, median carina of varying length. Sternum VIII shallowly, broadly emarginate apically, apicolateral arm not well defined (Fig. 1210); lateral view: Fig. 1211. Genitalia: Figs. 1212, 1213. Length 7.3–11.9 mm; head width 2.1–3.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1214).— New South Wales, Northern Territory, South Australia, Western Australia.

**RECORDS.**— HOLOTYPE: ♂, AUSTRALIA: New South Wales: Gilgandra, 28 Nov 1978, G.A. Holloway (AMS).

PARATYPES: AUSTRALIA: New South Wales: 13 mi. E Broken Hill, 4 Mar 1963, K. Dansie (1 ♂, SAM); Fowlers Gap Research Station at  $31^{\circ}05'S$   $141^{\circ}42'E$ , 29 Nov – 2 Dec 1981, J.C. Cardale (1 ♀, 3 ♂, ANIC), I.D. Naumann and J.C. Cardale (2 ♂, ANIC); Gilgandra, 28 Nov 1978, G.A. Holloway (2 ♂, AMS); Gnalta Station 257.5 km N Broken Hill, 8 Dec 1964, N. McFarland (1 ♂, SAM); Menindee, 2 Dec 1992, N.W. Rodd (1 ♀, AMS); Myalla Tank at  $31^{\circ}50'S$   $141^{\circ}57'E$ , 21 Jan 1999, J. Carpenter and A. Davidson (1 ♂, AMNH). Northern Territory: 8 km N Alice Springs, 8 Nov 1979, G. Griffin (1 ♀, NTM). South Australia: Calperum Station 16 km N Renmark at  $34^{\circ}02.9'S$   $140^{\circ}42.2'E$ , 3 Dec 2010, V. Ahrens and W.J. Pulawski (1 ♂, CAS); Dingly Dell Camp on Orparinna Creek at  $31^{\circ}21'S$   $138^{\circ}42'E$ , I.D. Naumann and J.C. Cardale, 4 Nov 1987 (1 ♀, 1 ♂, ANIC), 4–10 Nov 1987 (1 ♂, ANIC), and 7 Nov 1987 (6 ♂, ANIC); Mount Serle in Northern Flinders Ranges, no date, Hale and Tindale (2 ♂, SAM), Musgrave Ranges at  $26^{\circ}20'S$   $131^{\circ}25'E$ , 9 May 1983, G.A. Holloway (2 ♀, AMS); Ororoo, collector unknown, 13 Nov 1943 (2 ♂, SAM), 14 Nov 1943 (2 ♂, SAM), and 5 Dec 1943 (1 ♂, SAM); 79 km NNW Renmark at  $33^{\circ}31'S$   $140^{\circ}24'E$ , 8 Nov – 12 Dec 1995, K.R. Pullen (1 ♂, ANIC); Wilpena in Flinders Ranges National Park at  $31^{\circ}31.7'S$   $138^{\circ}36.2'E$ , V. Ahrens and W.J. Pulawski, 20 Dec 2010 (2 ♀, 8 ♂, CAS), 21 Dec 2010 (4 ♀, 9 ♂, CAS), 22 Dec 2010 (7 ♀, 5 ♂, CAS); 3 km ENE Wilpena in Flinders Ranges National Park at  $31^{\circ}31.0'E$   $138^{\circ}36.6'E$ , V. Ahrens and W.J. Pulawski, 23 Dec 2010 (1 ♀, 5 ♂, CAS), 26 Jan 2011 (4 ♀, 6 ♂, CAS), 27 Jan 2011 (8 ♀, 11 ♂, CAS); 34 km S Wilpena, 4 Jan 1980, R.M. Bohart (6 ♂, UCD); Wirreanda Creek



FIGURE 1214. Collecting localities of *Pison xanthognathos* Pulawski, sp. nov.

28 km SW Hawker at 32°05.9'S 138°17.7'E, 26 Jan 2011, V. Ahrens and W.J. Pulawski (1 ♀, 1 ♂, CAS). **Western Australia:** Ethel Creek Station 300 mi N Meekatharra at 22°54'S 120°10'E, 28 Nov 1971, N.S. Expedition IV (4 ♀, 1 ♂, WAM), Irrunytju Rockhole in Hineckley Range at 26°07'S 128°58'E, 19-21 Jan 1990, T.F. Houston and M.S. Harvey (2 ♂, WAM); 7 mi. NE Karratha, 17 Feb 1973, E.M. Exley (1 ♂, QMB); 28 mi. E Leonora, 18 Sept 1962, E.S. Ross and D.Q. Cavagnaro (1 ♀, 2 ♂, BMNH; 29 ♀, 32 ♂, CAS; 1 ♀, 1 ♂, NHMW); 36 km ESE Minnie Creek Homestead at 24°02'S 115°42'E, 2 Sept 1980 C.A. Howard and T.F. Houston (1 ♂, WAM); Perth: Upper Swan, Mar 1984, G.H. Lowe (1 ♀, WAM).

***Pison xenognathos* Pulawski, species nova**

Figures 1215-1225.

**NAME DERIVATION.**— *Xenognathos* is derived from two Greek words: ξενος, *strange*, and γναθος, *a jaw, mandible*, a noun in apposition to the generic name; with reference to the unusual structure of this species mandible.

**RECOGNITION.**— *Pison xenognathos* is an all black species with three submarginal cells and erect setae on tergum I. It is unique among the Australian *Pison* in having the posterior mandibular margin with a rounded expansion (Figs. 1217, 1218). In addition, the inner mandibular margin is tridentate in the female (Fig. 1215) and bidentate in the male (Fig. 1216). Also, the propleuron has punctures that average several diameters apart and are visibly larger than those on the forecoxal venter. The broadly arcuate male clypeal lamella is also unusual (Fig. 1216). *P. xenognathos* is the only species in which the female combines the erect setae on tergum I with the presence of a psammophore on the gena, mandible, and the forefemur, and with the lower gena impunctate and ase-tose adjacent to the oral fossa.

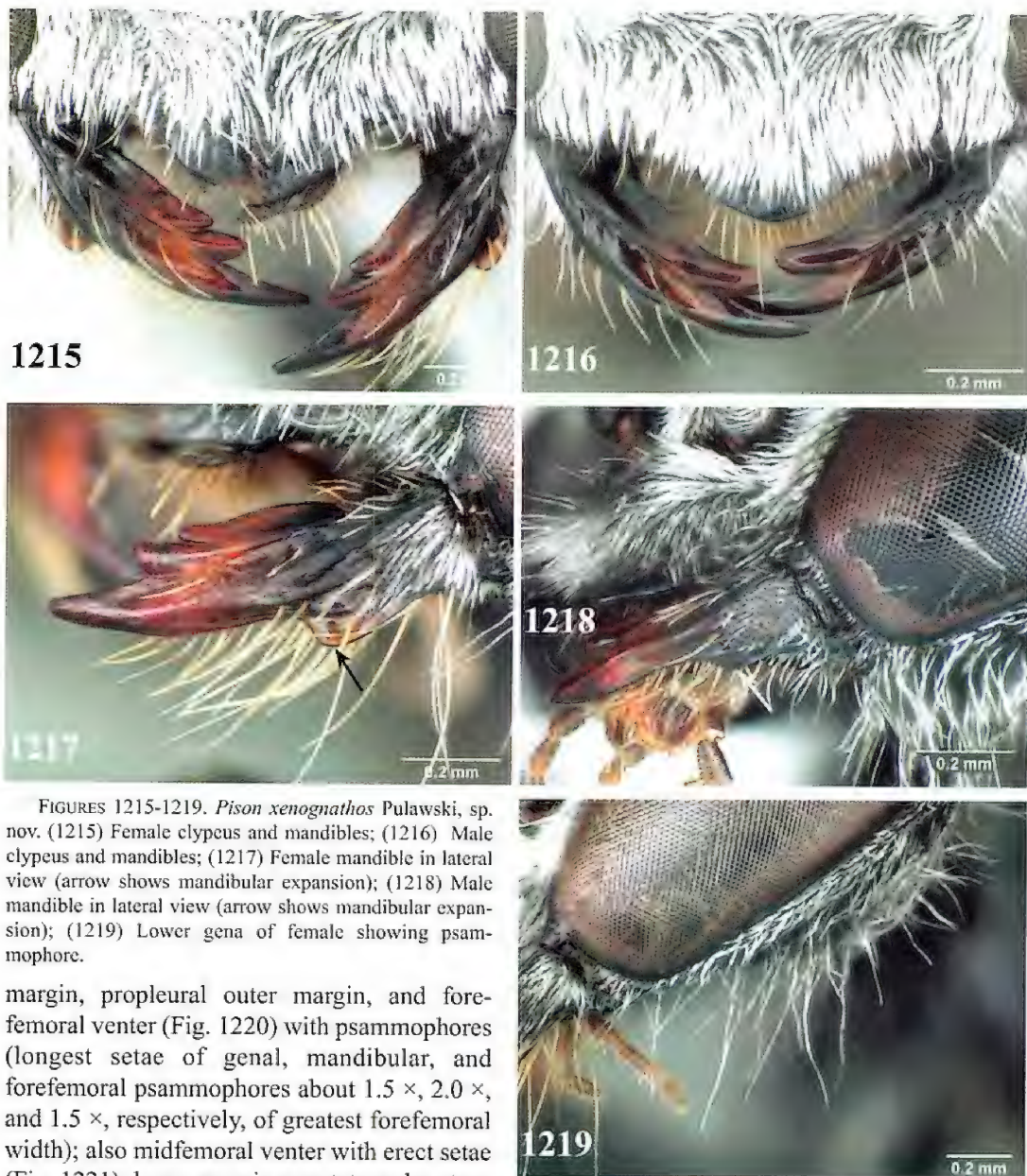
**DESCRIPTION.**— Frons dull, punctures superficial, less than one diameter apart. Occipital carina joining hypostomal carina. Mandible with rounded expansion at posterior mandibular margin (Fig. 1217, 1218). Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about three times as long as midocellar diameter. Propleural punctures averaging several diameters apart, markedly larger than those on forecoxal venter. Scutum not foveate along flange, with short, evanescent longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging less than one diameter apart; interspaces aciculate. Tegula slightly enlarged. Mesopleural punctures well defined, less than one diameter apart; interspaces microsculptured. Postspiracular carina present, about twice as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum conspicuously, obliquely, irregularly ridged (ridges anastomosed); side ridged, punctate between ridges (ridges evanescent in ventral half in most specimens); posterior surface ridged. Posteroventral forefemoral surface closely punctate. Punctures of tergum I well defined, averaging one or two diameters apart posteromesally (before apical depression). Punctures of sternum II many diameters apart, apical depression impunctate.

Setae silvery, erect on frons, thorax, propodeum, forecoxal venter, femoral venters, and tergum I, sinuous on lower gena (see below for details); completely concealing integument on clypeus in both sexes. Apical depressions of terga I-IV with silvery, setal fasciae.

Body all black except mandible ferruginous mesally and apical tarsomeres brown.

♀.— Upper interocular distance equal to  $0.66-0.68 \times$  lower interocular distance; ocellular distance equal to  $0.7-0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2 \times$  hindocellar diameter; eye height equal to  $0.86-0.90 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 1215). Dorsal length of flagellomere I  $2.1-2.2 \times$  apical width, of flagellomere IX  $1.2-1.3 \times$  apical width. Lower gena (Fig. 1219), mandibular posterior

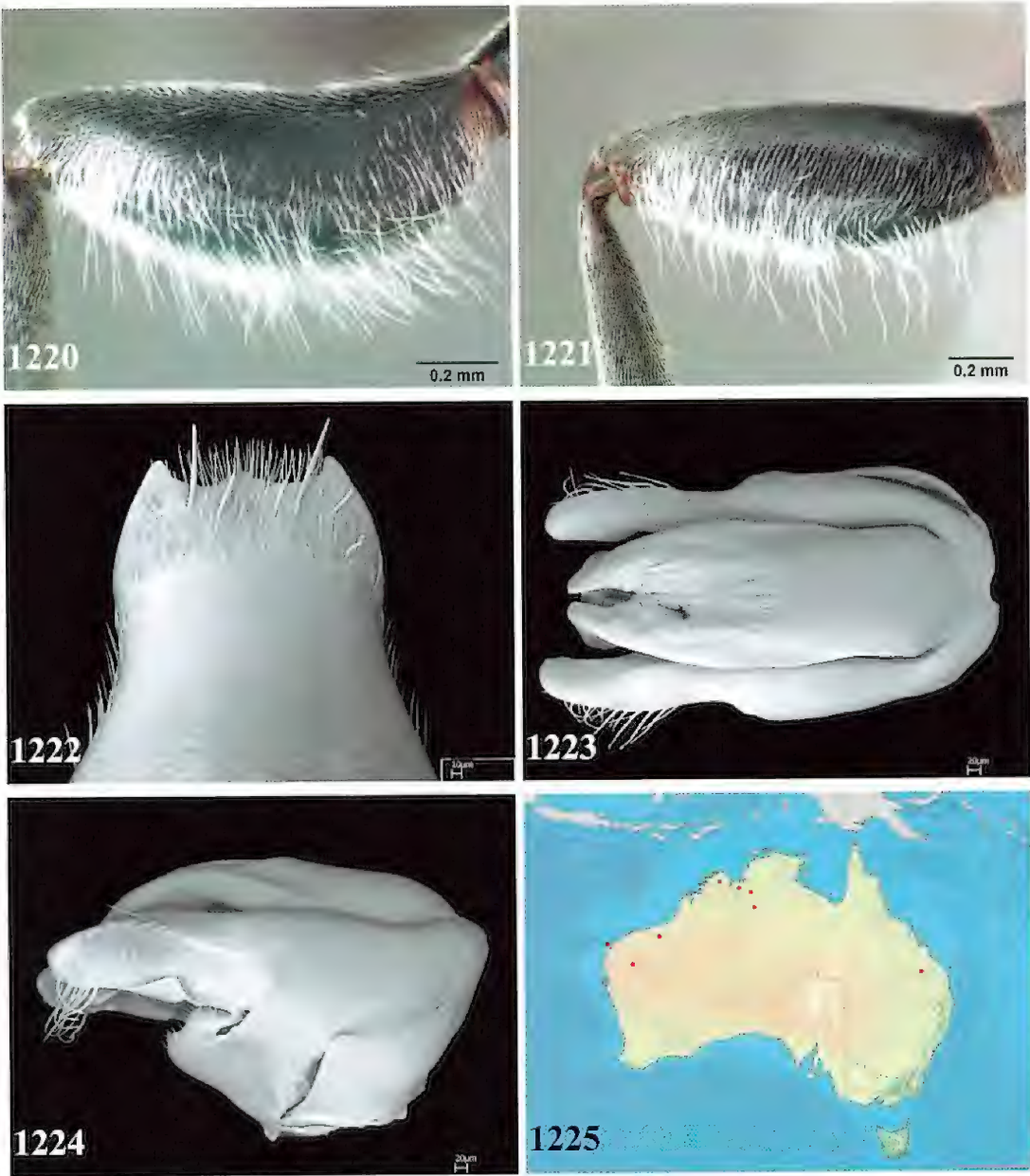




FIGURES 1215-1219. *Pison xenognathos* Pulawski, sp. nov. (1215) Female clypeus and mandibles; (1216) Male clypeus and mandibles; (1217) Female mandible in lateral view (arrow shows mandibular expansion); (1218) Male mandible in lateral view (arrow shows mandibular expansion); (1219) Lower gena of female showing psammophore.

margin, propleural outer margin, and fore-femoral venter (Fig. 1220) with psammophores (longest setae of genal, mandibular, and forefemoral psammophores about  $1.5 \times$ ,  $2.0 \times$ , and  $1.5 \times$ , respectively, of greatest forefemoral width); also midfemoral venter with erect setae (Fig. 1221); lower gena impunctate and asetose between oral fossa and psammophore. Mandible tridentate apically (Fig. 1215, 1217). Length 7.5-8.1 mm; head width 2.5-2.6 mm.

♂.— Upper interocular distance equal to  $0.76-0.80 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $1.2-1.4 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Free margin of clypeal lamella broadly arcuate (Fig. 1216). Dorsal length of flagellomere I  $2.0-2.1 \times$  apical width, of flagellomere X  $1.0-1.1 \times$  apical width. Mandible bidentate apically (Fig. 1216). Sternum VIII punctate only near apex and laterally, its apical margin truncate (Fig. 1222). Genitalia: Figs. 1223, 1224. Length 6.8-7.8 mm; head width 2.3-2.5 mm.



FIGURES 1220-1224. *Pison xenognathos* Pulawski, sp. nov. (1220) Female forefemur with setae; (1221) Female midfemur with setae; male; (1222) Sternum VIII (ventral surface); (1223) Genitalia in dorsal view; (1224) Genitalia in lateral view.

FIGURE 1225. Collecting localities of *Pison xenognathos* Pulawski, sp. nov.



**GEOGRAPHIC DISTRIBUTION** (Fig. 1225).— Northern Territory, Queensland, Western Australia.

**RECORDS.**— **HOLOTYPE:** ♀, **AUSTRALIA: Western Australia:** Mount Augustus National Park at 24°18.0'S 116°47.6'E, 25 Apr – 7 May 2003, M.E Irwin and F.D. Parker (ANIC).

**PARATYPES:** **AUSTRALIA: Northern Territory:** 65 km S Kalkarindji at 17°55.9'S 130°49.7'E, 11-17 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Gregory National Park at 16°12'47"S 130°25'11"E, 18 June 2001, M.E. Irwin, F.D. Parker, and C. Lambkin (1 ♂, CAS); Keep River National Park at 15°45'44"S 129°05'55"E, 10-20 June 2001, M.E Irwin and F.D. Parker (1 ♂, ANIC; 1 ♀, CAS). **Queensland:** Isla Gorge National Park at 25°11'S 149°58'E, 13 Sept 1992, G. Daniels (1 ♀, QMB). **Western Australia:** Cape Range National Park at 22°01.8'S 113°55.9'E, 28 Apr 2003, M.E Irwin and F.D. Parker (1 ♂, ANIC); Drysdale River at 15°02'S 126°55'E, 3-8 Aug 1975, I.F.B. Common and M.S. Upton (1 ♀, ANIC); 11 km E Marble Bar at 21°09.0'S 119°51.7'E, 2-14 May 2003, M.E Irwin and F.D. Parker (1 ♀, ANIC; 1 ♂, CAS); same data as holotype (1 ♀, CAS).

### *PISON* OF NEW GUINEA

Of the 17 species found on the island of New Guinea, 8 are endemic, 9 are shared with Australia, one (*P. punctifrons*) is shared with Australia and the Pacific Islands., and one (*P. pistillum*) with the Pacific Islands.

### Key for Species Identification

- 1 Forewing with only two submarginal cells . . . . . 2
- Forewing with three submarginal cells . . . . . 5
2. Tergum I elongate (its length about  $1.5 \times$  apical width, all or partly ferrugineous or pale yellow; flagellum markedly elongate, e.g., dorsal length of flagellomere III  $2.6-2.8 \times$  apical width in female and  $2.5 \times$  in male. Female: clypeal lip prominently, roundly elongate (Fig. 309) . . . . . *difficile* Turner, p. 152
- Tergum I not elongate, its length less than apical width, black or with slight bluish lustre; flagellum not elongate, e.g., dorsal length of flagellomere III  $1.3-1.6 \times$  apical width in female, and  $1.1 \times$  in male. Female: clypeal lip not elongate . . . . . 3
3. Scutum without small longitudinal ridges adjacent to posterior margin; mesopleuron sparsely punctate; posteroventral surface of forefemur and terga I and II practically impunctate; propodeal dorsum finely punctate (punctures several diameters apart) and also with ill-defined, transverse ridges that are invisible from several angles; posterior propodeal surface unridged, with well-defined punctures; posterior margin of second submarginal cell equal to  $2.1 \times$  its height . . . . . *metallescent* Pulawski, sp. nov., p. 511
- Scutum with small longitudinal ridges adjacent to posterior margin (ridges evanescent or absent in some *P. aberrans*); mesopleuron, posteroventral surface of forefemur, and terga I and II uniformly, closely punctate; propodeal dorsum rugose; posterior propodeal surface transversely ridged; posterior margin of second submarginal cell equal to  $0.7-1.4 \times$  its height (Fig. 7) . . . . . 4
4. Female: dorsal length of flagellomere I  $1.3-1.6 \times$  apical width; clypeal lamella in about same plane as more dorsal part . . . . . *aberrans* Turner, p. 37
- Female: dorsal length of flagellomere I  $2.1 \times$  apical width; clypeal lamella bent posteriorly, forming angle with more dorsal part of clypeus. Male unknown. . . . . *incurvatum* Pulawski, sp. nov., p. 234
5. Tergum I with erect setae . . . . . 6
- Tergum I with appressed setae . . . . . 8

- 6. Frontal punctures fine, several diameters apart (Fig. 1239); posterior mandibular margin stepped (Figs. 1240, 1241); forewing partly asetose in basal half (Fig. 1244); antenna unusually long: dorsal length of flagellomere I  $3.1\text{--}3.2 \times$  apical width in female and  $2.6\text{--}3.0$  in male; male flagellomeres IV and V emarginate basoventrally (Fig. 1246); inner dorsal carina of hindcoxa not expended into tooth. . . . . *nogorombu* Pulawski, p. 514
- Frontal punctures large, some of them equal to  $0.3\text{--}0.6 \times$  midocellar diameter, less than one diameter apart (Fig. 911); posterior mandibular margin not stepped; forewing all setose; antenna shorter; male flagellomeres not emarginate; inner dorsal carina of hindcoxa expanded into prominent tooth basally. . . . . 7
- 7. Female: clypeal lamella acutely to slightly obliquely angulate (Figs. 908, 909); trimmal carina of mandible in most specimens with well defined, rounded tooth at about two thirds of length (Fig. 908). Male: clypeal lamella acutely angulate (Fig. 910). . . . *punctifrons* Shuckard, p. 373
- Female: clypeal lamella truncate (Fig. 1268); trimmal carina of mandible with minute incision at about two thirds of length (Fig. 1268). Male: clypeal lamella obtusely tridentate (Fig. 1269), truncate in some specimens . . . . . *pandambai* Pulawski, sp. nov., p. 523
- 8. Second recurrent vein received near half length to three quarters of length of second submarginal cell (Fig. 1281) . . . . . 9
- Second recurrent vein interstitial with second intersubmarginal vein or nearly so, or received well on third submarginal cell. . . . . 13
- 9. Gaster pedunculate, length of tergum I markedly greater than apical width (Figs. 1201, 1283); distance between spiracles of tergum I smaller than distance between spiracle and gastropodeal articulation; ommatidia markedly larger in lower half of eye than those in dorsal half (Fig. 1199, 1278). . . . . 10
- Gaster not pedunculate, length of tergum I approximately equal to apical width; distance between spiracles of tergum I greater than distance between spiracle and gastropodeal articulation; ommatidia about equal size both dorsally and ventrally . . . . . 11
- 10. Clypeus with barely indicated median lobe (Fig. 1198), its surface flat; median supraantennal carina absent; dorsal length of flagellomere I  $1.8\text{--}1.9 \times$  apical width; eye notch rounded; forewing media diverging from M+Cu at crossvein cu-a or shortly after it; tergum VI not carinate apically; sternum II punctate throughout; gastral segment I ferruginous (Fig. 1202); length  $5.4\text{--}6.5$  mm . . . . . *woji* Menke, p. 498
- Clypeus with well defined median lobe (Fig. 1276), its dorsomedian part elevated, separated by angle from ventral portion; median supraantennal carina present; dorsal length of flagellomere I  $4.0\text{--}4.5 \times$  apical width; eye notch acute (Fig. 1280); forewing media diverging from M+Cu well before crossvein cu-a (Fig. 1282); tergum VI carinate apically; sternum II impunctate apicomersally; gaster black; length  $10.0\text{--}10.5$  mm . . . . . *pistillum* Menke, p. 526
- 11. Scutal punctures conspicuous (Fig. 590), some punctures up to two or three diameters apart; mesopleural punctures conspicuous, increasing in size toward venter, up to about two diameters apart ventrally (Fig. 591); second recurrent vein ending on submarginal cell II at two thirds to three quarters of latter's length (Fig. 592); gaster and legs black; length:  $9.5\text{--}10.8$  mm in female,  $7.2\text{--}8.5$  mm in male. Female: tergum VI elongate (Fig. 594). . . . .
- Scutal punctures markedly finer, in many specimens less than one diameter apart; mesopleural punctures inconspicuous, as large dorsally as ventrally; second recurrent vein received near middle of second submarginal cell in vast majority of specimens, toward two thirds of length in . . . . . *leptogaster* Pulawski, sp. nov., p. 254



- some; gaster and legs black or ferruginous; length 5.8-8.5 mm in female, 5.3-8.0 mm in male. Female: tergum VI not elongate ..... 12
12. Gaster all or largely ferruginous. Male: sternum VIII punctate and setose except basally (Fig. 789) ..... *peletieri* Le Guillou, p. 327
- Gaster all black. Male: sternum VIII punctate and setose only along hindmargin (Fig. 82) ..... *argentatum* Shuckard, p. 64
13. Gaster ferruginous; clypeal lamella of equal length medially and laterally; mesopleural punctures markedly larger ventrally than dorsally; tibiae without spines ..... *oresbios* Pulawski, sp. nov., p. 521
- Gaster black; clypeal lamella longer medially than laterally; mesopleural punctures of about equal size dorsally and ventrally; tibiae with at least evanescent spines. .... 14
14. Propodeal dorsum punctate, not ridged. .... 15
- Propodeal dorsum ridged (ridges varying from conspicuous to evanescent). .... 19
15. Scutal flange significantly expanded, largely covering tegula (Fig. 563); frontal punctures several diameters apart; propodeum without longitudinal carina separating side from dorsum and posterior surface, its entire surface (except for median sulcus) with punctures that are several diameters apart, interspaces unridged (Fig. 565). .... *laeve* F. Smith, p. 243
- Scutal flange not expanded (of usual size); frontal punctures up to 2-3 diameters apart, mostly less; propodeum in most specimens with longitudinal carina separating side from dorsum and posterior surface; propodeal punctures denser, posterior surface transversely ridged (in ventral third only in *P. novabritannicae*) ..... 16
16. Tergum I conspicuously microareolate between sparse punctures (Fig. 1256) ..... *novabritannicae* Tsuneki, p. 517
- Tergum I unsculptured or aciculate between punctures ..... 17
17. Setae of lower gena sinuosus, suberect, up to  $1.5 \times$  midocellar width. Female: free margin of clypeal lamella (Fig. 630) angulate (acutely to obtusely); acetabular groove of mandible with one row of punctures. .... *marginatum* F. Smith, p. 267
- Setae of lower gena curved, subappressed, about as long as midocellar width. Female: free margin of clypeal lamella evenly arcuate; acetabular groove of mandible with two rows of punctures ..... 18
18. Scape ferruginous ventrally; punctures of upper frons more than one diameter apart; some mesopleural punctures at center about one diameter apart, whereas others up to about three diameters apart (but anteriorly, dorsally, and next to metapleuron less than one diameter apart); punctures of tergum I averaging 2-3 diameters apart between horizontal part and basal declivity; inner surface of foretibia ferruginous in apical two fifth ..... *erimaense* Tsuneki, p. 510
- Scape black ventrally; punctures of upper frons about one diameter apart; mesopleural punctures at center averaging about one diameter apart (some punctures up to two diameters apart); punctures of tergum I several diameters apart between horizontal part and basal declivity; foretibia all black ..... *novaguineanum* Tsuneki, p. 520
19. Mesopleural punctures markedly less than one diameter apart. Female: lower gena unsculptured on each side of oral fossa, unsculptured area bordered by psammophore on the outside. Male: apical margin of sternum VIII rounded, not emarginate (Fig. 925). .... *pusillum* Pulawski, n. sp., p. 380
- Mesopleural punctures slightly more than one diameter apart to several diameters apart. Female: lower gena punctate throughout, without psammophore; forefemur without psammophore. Male: apical margin of sternum VIII emarginate (Fig. 1193) .... *westwoodii* Shuckard, p. 487

## Species Descriptions

N.B. The species shared with Australia are described under *Pison* of Australia above.

### *Pison erimaense* Tsuneki

Figures 1226-1228.

*Pison erimaense* Tsuneki, 1983:50. ♀. Holotype: ♀, New Guinea: Madang Province: Erima (MTM), examined. – Tsuneki, 1983:42 (in key to *Pison* of New Guinea).

**RECOGNITION.**— *Pison erimaense* is an all black species (except for a small portion of the foretibia), with three submarginal cells, the second recurrent vein interstitial with the second inter-submarginal vein, and the setae appressed on tergum I. It can be recognized by an evenly arcuate clypeal lamella (Fig. 1226), the interocellar distance equal to  $0.6 \times$  midocellar width, punctate propodeal dorsum (punctures about two or three diameters apart near the median sulcus, about one diameter apart laterally), with unsculptured interspaces (Fig. 1227), sterna punctate throughout, and dorsal length of flagellomere I  $3.3 \times$  apical width. It is closely similar to *P. novaguineanum*. They share several essential characters such as the shape of the clypeal lamella, the length of flagellomere I, the punctuation of the propodeal dorsum, the evanescent spines on the outer side of the hindtibia, the shape and length of setae; also, the area around the clypeal sockets is characteristically sunken and the supraantennal area swollen in both species. They differ by several rather minor characters (see the key to *Pison* of New Guinea) that may represent individual variation rather than specific differences. *Pison erimaense* is known from four females and *P. novaguineanum* from the holotype only. Additional material is needed to ascertain these species status.

**DESCRIPTION.**— Frons swollen mesally above antennal base, frontal punctures averaging more than one diameter apart; interspaces dull, microsculptured. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal area without transverse pit. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures of medium size, mostly about one or two diameters apart (some punctures up to three diameters apart); interspaces microsculptured, dull. Tegula enlarged. Mesopleural punctures well defined, some of them at center about one diameter apart whereas others up to three diameters apart (but less than one diameter apart anteriorly, dorsally, and next to metapleuron). Postspiracular carina present, about as long as midocellar width; area between postspiracular carina and episternal sulcus minutely punctate. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum



FIGURES 1226-1227. *Pison erimaense* Tsuneki, female. (1226). Clypeus; (1227) Propodeal dorsum.



and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, punctures about two or three diameters apart near midline, about one diameter apart laterally, with middle carina in shallow sulcus, interspaces unsculptured (Fig. 1227); side with well-defined punctures that are less than one diameter apart, also ridged anteriorly, not posteriorly; posterior surface conspicuously, transversely ridged. Posteroventral forefemoral surface minutely punctate, punctures 2-3 diameters apart. Outer surface of hindtibia with evanescent spines. Punctures of tergum I averaging 2-3 diameters apart between horizontal part and basal declivity. Hindcoxal dorsum with outer margin sharply carinate; inner margin with low, obtuse tooth basally. Sterna punctate throughout.

Setae silvery, appressed on frons except subappressed and about as long as midocellar width between midfrontal carina and midocellus, appressed on scutum and tergum, on lower gena subappressed, curved, about as long as midocellar width; not concealing integument on clypeus. Apical depressions of terga with silvery, setal fasciae.

Body black, mandible dark ferruginous preapically, inner surface of foretibia ferruginous in apical two fifths.

♀.—Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar width, distance between hindocelli equal to  $0.6 \times$  hindocellar width; eye height equal to  $0.96 \times$  distance between eye notches. Free margin of clypeal lamella evenly arcuate (Fig. 1226). Dorsal length of flagellomere I  $3.3 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength; acetabular groove with two rows of punctures. Length 12.4 mm; head width 3.8 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1228).—Known from one locality in Papua New Guinea.

**RECORDS.**—**Papua New Guinea: Madang Province:** Erima (4 ♀, MTM, holotype and paratypes of *Pison erimaense*).



FIGURE 1228. Collecting locality of *Pison erimaense* Tsuneki.

***Pison metallescens* Pulawski, species nova**

Figures 1229-1236.

**NAME DERIVATION.**—*Metallescens* is a Neolatin word meaning *with metallic shine*; with reference to this species head, thorax, and propodeum color.

**RECOGNITION.**—Among the New Guinean *Pison*, the three species with only two submarginal cells are *P. aberrans*, *P. difficile*, and *P. metallescens*. They differ by a number of characters indicated in the key. *Pison metallescens* differs from all the Australian and New Guinean species with only two submarginal cells in having terga I and II practically impunctate (Fig. 1235) rather than densely punctate, and also in having the head, thorax, and propodeum with an inconspicuous bluish lustre (rather than all black). Subsidiary recognition features are: the gaster sessile (the length of tergum I is smaller than its apical width), the posterior margin of the second submarginal cell equal to  $2.1 \times$  its height (Fig. 1234), the tegula largely impunctate posteriorly, the mesopleuron sparsely punctate, the posteroventral surface of the forefemur impunctate, the propodeal dorsum finely punctae (Fig. 1233), and the posterior propodeal surface unridged, with well-defined punctures.



FIGURES 1229-1234. *Pison metallescens* Pulawski, sp. nov., female. (1229) Clypeus and mandibles; (1230) Upper frons; (1231) Head in dorsal view; (1232) Tegula and adjacent scutum; (1233) Propodeal dorsum; (1234) Left forewing.



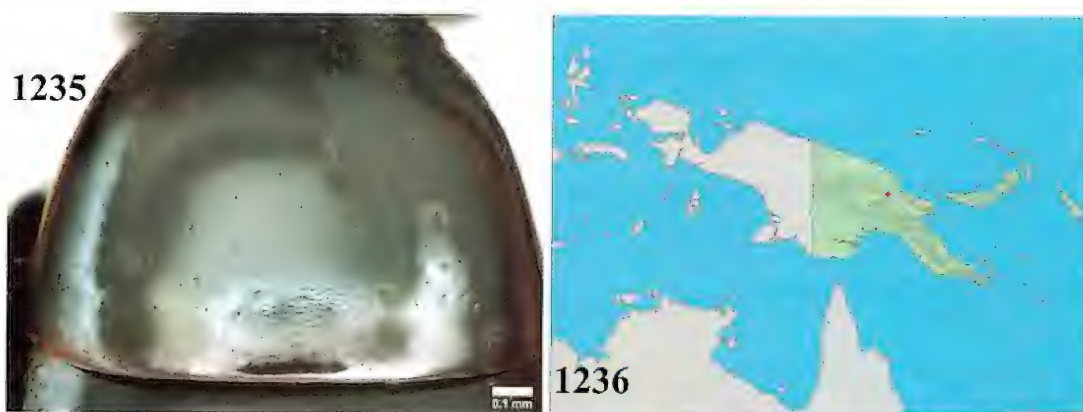


FIGURE 1235. *Pison metallescens* Pulawski, sp. nov., female. (1235) Tergum I.

FIGURE 1236. Collecting locality of *Pison metallescens* Pulawski, sp. nov.

**DESCRIPTION.**—Frons aciculate but not totally dull, finely punctate, punctures on upper frons averaging about 2-3 diameters apart (Fig. 1230), middle supraantennal carina rudimentary. Occipital carina slightly expanded ventrally. Labrum emarginate. Gena narrow in dorsal view (Fig. 1231). Anteromedian pronotal pit transversely elongate, about  $3 \times$  as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine, averaging about one diameter apart (Fig. 1232). Tegula somewhat expanded, fully covering humeral plate. Mesopleural punctures fine, several diameters apart except near borders. Postspiracular carina ill defined. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum finely punctate (punctures several diameters apart) and also with ill-defined, transverse ridges that are invisible from several angles (Fig. 1233); side unsculptured on disk, with several fine ridged anterodorsally; posterior surface unridged, with well-defined punctures. Forewing with two submarginal cells; posterior margin of second submarginal cell equal to  $2.1 \times$  its height (Fig. 1234). Posteroventral forefemoral surface and posterior surface of midfemur with only a few scattered punctures, practically impunctate. Outer surface of hindtibia with minute spines. Horizontal surface of tergum I with a few, sparse punctures (Fig. 1235); terga II and III with sparse punctures that are many diameters apart. Sternum II (except laterally) with a few, sparse punctures.

Setae silvery, on frons oriented uniformly dorsad, on postocellar area erect but shorter than midocellar diameter, appressed on scutum and tergum I, on lower gena suberect, shorter than midocellar diameter; not concealing integument on clypeus. Apical depressions of terga without setal fasciae.

Head, thorax, propodeum and gaster black with inconspicuous bluish lustre except mandible and flagellar venter ferruginous (mandible black basally, brown apically; flagellum all black apically). Wing membrane yellowish, veins in basal half pale yellow. Femora black; foretibia black, ferruginous on inner surface and on apical third, midtibia black, ferruginous on anterior surface, hindtibia black, partly ferruginous on posterior (= inner) surface; tarsi ferruginous.

♀.—Upper interocular distance equal to  $0.96 \times$  lower interocular distance; ocellocular distance equal to  $1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0 \times$  hindocellar diameter; eye height equal to  $1.10 \times$  distance between eye notches. Free margin of clypeal lamella subrectangular (Fig. 1229). Dorsal length of flagellomere I  $1.5 \times$  apical width, of flagellomere IX

1.1 × apical width. Mandible: trimmal carina without small incision. Tergum VI with median carina at very apex. Length 7.3 mm; head width 1.8 mm.

♂.— Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1236).— Known from a single locality in Papua New Guinea mountains.

**RECORDS.**— HOLOTYPE: ♀, PAPUA NEW GUINEA: **Madang Province:** Pandambai 6 air km W Bundi at 5°38'S 145°11'E, alt. 2,330 m, 10-13 May 1888, W.J. Pulawski (CAS).

***Pison nogorombu* Pulawski**

Figures 1237-1250.

*Pison* sp.: Menke, 1988a:4 (photograph of mandible) and 6 (mandible with step on posterior margin).

*Pison nogorombu*: Antropov and Pulawski, 1989:318 (nomen nudum).

*Pison nogorombu* Pulawski, 1989:468, ♀, ♂. Holotype: Papua New Guinea: Madang Province: Bundi (CAS).

**RECOGNITION.**— *Pison nogorombu* is an all black species, with three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, and abundant erect setae on the head, thorax, propodeum, and gastral segment I (most setae 3 × as long as midocellar width). It can be recognized by a mandible with the posterior margin stepped and straight between the base and the step (Figs. 1240, 1241), and by the forewing asetose basally (Fig. 1244). Subsidiary recognition features are: propodeum all unridged, with well-defined punctures that average more than one diameter apart (Fig. 1243), without carina separating side from dorsum and posterior surface, and in the male: free margin of clypeal lamella obtusely tridentate (1238), flagellomeres IV and V emarginate basoventrally (Fig. 1246), bottom of emarginations longitudinally microridged.

**DESCRIPTION.**— Frons dull, punctures well defined to inconspicuous, averaging several diameters apart, interspaces markedly microareolate (Fig. 1239). Posterior mandibular margin step-like, straight between base and step (Figs. 1240, 1241). Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about twice as long as midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging several diameters apart; interspaces microareolate (Fig. 1242). Tegula slightly enlarged. Mesopleural punctures well defined, averaging about one diameter apart dorsally, more than one diameter apart ventrally. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus inconspicuously costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and

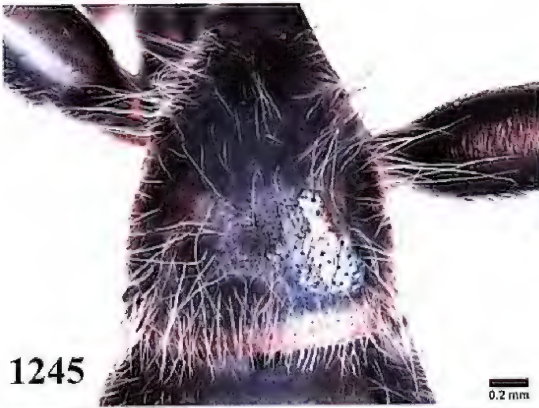


FIGURES 1237-1238. *Pison nogorombu* Pulawski. (1237) Female clypeus and mandibles; (1238) Male clypeus and mandibles.





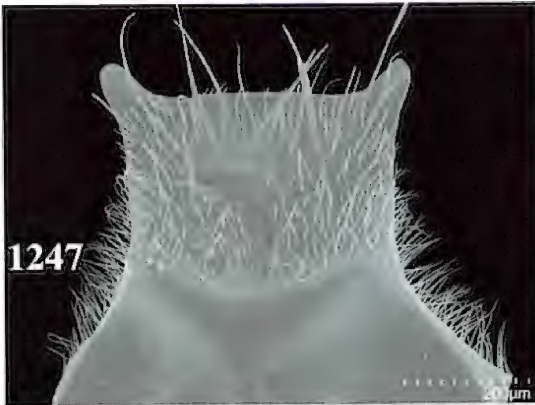
FIGURES 1239-1244. *Pison nogorombu* Pulawski. (1239) Upper frons of female; (1240) Portion of female mandible (outer surface; arrow shows stepped mandibular margin); (1241) Same at higher magnification; (1242) Female tegula and adjacent scutum; (1243) Propodeal dorsum of female; (1244) Left forewing of female.



1245



1246



1247



1248



1249

FIGURES 1245-1246. *Pison nogorombu* Pulawski. (1245) Female tergum I; (1246) Basal flagellomeres of male; (1247) Male sternum VIII (ventral surface); (1248) Male genitalia in dorsal view; (1249) Male genitalia in lateral view.

posterior surface and extending from gastral socket area toward spiracle; its entire surface unridged, with well-defined punctures that average more than one diameter apart (Fig. 1243). Forewing partly asetose basally: setae fully absent from median cell except along foremargin, from submedian cell except along hindmargin, from discoidal cell basally, and from subdiscoidal cell except posteriorly and distally (Fig. 1244). Posteroventral forefemoral surface finely punctate, punctures more than one diameter apart. Hindecoxal dorsum with outer margin sharply carinate posteriorly. Outer surface of hindtibia with a few, inconspicuous spines. Gaster moderately elongate: length of tergum I about  $1.7 \times$  apical width (Fig. 1245); distance between gastral base and spiracle about  $0.7 \times$  distance between spiracles. Horizontal portion of tergum I with fine punctures that are several diameters apart. Sternum II with few minute punctures that are many diameters apart, impunctate apicomeresally.

Setae silvery, erect on upper frons, lower gena, thorax, propodeum, forecoxal venter, femoral venters, and tergum I (Fig. 1245) and sternum I, as long as  $2\text{-}3 \times$  midocellar diameter, not



concealing integument on clypeus; setae on lower frons practically straight. Apical depressions of terga without silvery, setal fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.50 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella roundly prominent (Fig. 1237). Dorsal length of flagellomere I  $3.1\text{--}3.2 \times$  apical width, of flagellomere IX  $1.6 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Length 10.0–10.5 mm; head width 2.7–3.0 mm.

♂.—Upper interocular distance equal to  $0.60 \times$  lower interocular distance; ocellocular distance equal to  $1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella obtusely tridentate (Fig. 1238). Flagellomeres IV and V emarginate basoventrally (Fig. 1246), bottom of emargination longitudinally microridged. Dorsal length of flagellomere I  $2.6\text{--}3.0 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 1247). Genitalia: Figs. 1248, 1249. Length 9.0–10.0 mm; head width 2.4–2.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1250).—Island of New Guinea at higher elevations (1,000–2,330 m a.s.l.).

**RECORDS** (from Pulawski, 1989, if number of specimens not indicated).—**INDONESIA: Western Papua** (= Indonesian New Guinea): Araboebivak ca 12 km NE Lake Paniai, Baliem River Camp at  $4^{\circ}10'S$   $139^{\circ}00'E$ , Danau (= Lake Paniai) at  $3^{\circ}50'S$   $136^{\circ}15'E$ , Mist Camp at about  $3^{\circ}28'S$   $139^{\circ}06'E$  (1 ♀, CAS), Rattan Camp at about  $3^{\circ}28'S$   $139^{\circ}13'E$ , Sibil Valley in Star Mountains at  $5^{\circ}00'S$   $141^{\circ}00'E$ , Top Camp at about  $3^{\circ}30'S$   $139^{\circ}04'E$ .

**PAPUA NEW GUINEA: Eastern Highlands Province:** Aiyura at  $6^{\circ}19'S$   $145^{\circ}55'E$ , Daulo Pass at  $5^{\circ}55'S$   $145^{\circ}18'E$ , Moife 15 km NW Okapa (which is  $6^{\circ}32'S$   $145^{\circ}37'E$ ), Mount Otto at  $5^{\circ}58'S$   $145^{\circ}29'E$ , 22 km SE Okapa (1 ♀, CAS). **Madang Province:** Bundi at  $5^{\circ}45'S$   $145^{\circ}15'E$  (2 ♀, CAS), 5 air km NE Mundi-ai Pass at  $5^{\circ}48'S$   $145^{\circ}09'E$  (1 ♀, 4 ♂, CAS), Pandambai 6 air km W Bundi at  $5^{\circ}38'S$   $145^{\circ}11'E$  (4 ♀, 2 ♂, CAS), Simbai at  $5^{\circ}17'S$   $144^{\circ}26'E$  (1 ♀, CAS), Teptep at  $5^{\circ}55'S$   $146^{\circ}30'E$  (1 ♀, CAS). **Morobe Province:** Ulap, Wau, Wau: Edie Creek, Wau: Mount Kaindi. **Southern Highlands Province:** 8 km W Mendi (which is  $6^{\circ}08'S$   $143^{\circ}39'E$ ), Mendi to Mount Hagen (1 ♀, BISH), above Tigobi near Tari at  $5^{\circ}53'S$   $142^{\circ}57'E$ .



FIGURE 1250. Collecting localities of *Pison nogorombu* Pulawski.

### *Pison novabritannicae* Tsuneki

Figures 1251–1260.

*Pison novabritannicae* Tsuneki, 1982:40, ♀. Holotype: ♀, Papua New Guinea: Bismarck Archipelago: New Britain: Yalom (ZMUC), examined.

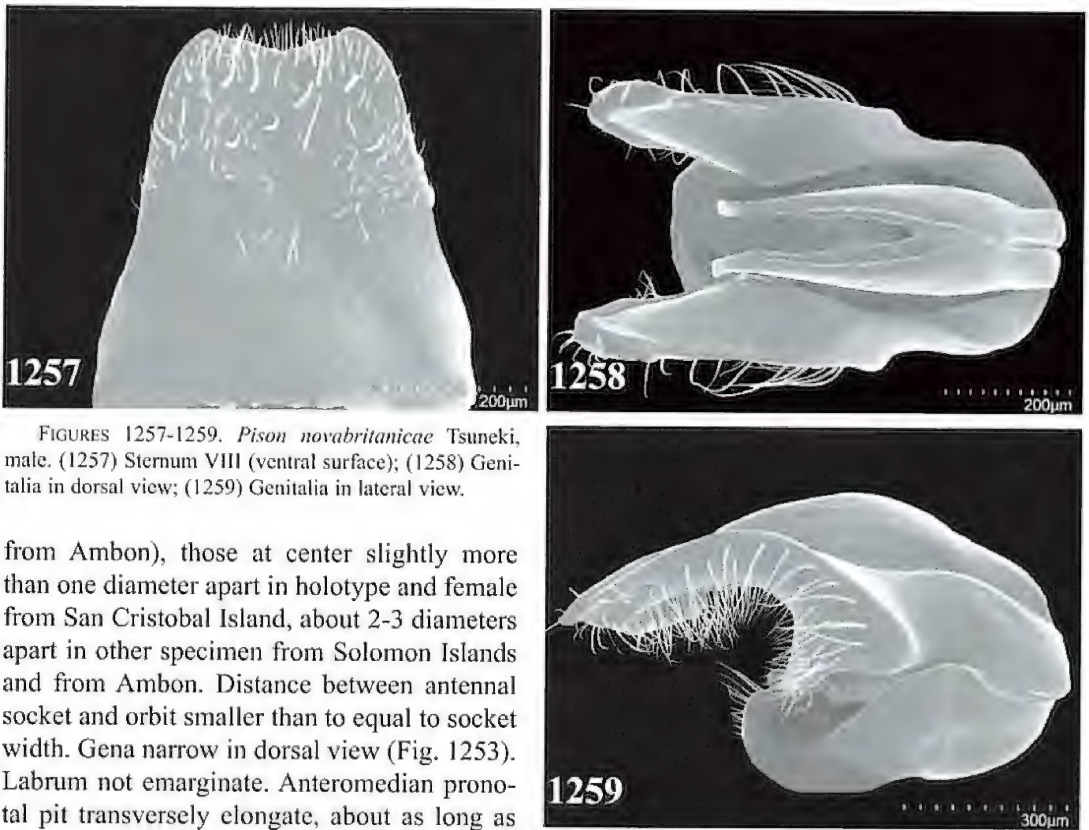
**RECOGNITION.**—*Pison novabritannicae* is an all black species with appressed setae on tergum I, on the lower gena with erect setae (curved apically) that are as long as  $0.5 \times$  midocellar diameter, and a minutely, sparsely punctate propodeal dorsum (most punctures 3–5 diameters apart, lateral punctures 1–3 diameters apart). It can be immediately recognized by terga I and II conspicuously microareolate, with sparse punctures (Fig. 1256).

**DESCRIPTION.**—Frons dull, mostly with well-defined punctures (punctures fine in specimen



FIGURES 1251-1256. *Pison novabritannicae* Tsuneki. (1251) Female clypeus and mandibles; (1252) Male clypeus and mandibles; (1253) Female head in dorsal view; (1254) Female vertex; (1255) Propodeal dorsum of female; (1256) Female tergum I.





FIGURES 1257-1259. *Pison novabritannicae* Tsuneki, male. (1257) Sternum VIII (ventral surface); (1258) Genitalia in dorsal view; (1259) Genitalia in lateral view.

from Ambon), those at center slightly more than one diameter apart in holotype and female from San Cristobal Island, about 2-3 diameters apart in other specimen from Solomon Islands and from Ambon. Distance between antennal socket and orbit smaller than to equal to socket width. Gena narrow in dorsal view (Fig. 1253). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin in holotype and specimen from San Cristobal Island and that from Ambon, without ridges in specimen from Malaita; scutal punctures minute, averaging 2-3 diameter apart. Tegula slightly enlarged. Mesopleural punctures fine, averaging several diameters apart at center; interspaces aciculate except unsculptured in specimen from Ambon. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits, not costulate in specimen from Ambon. Propodeum mostly with longitudinal carina separating side from posterior half of dorsum and posterior surface and extending from gastral socket area toward spiracle but not attaining it; carina replaced by series of large punctures in specimen from Malaita, and absent in specimen from Ambon; dorsum with shallow middle depression, minutely punctate (most punctures 3-5 diameters apart, lateral punctures 1-3 diameters apart in most specimens), interspaces aciculate (Fig. 1255); side punctate or finely ridged, punctures averaging about one diameter apart (2-3 diameters apart in specimen from Ambon), interspaces unsculptured, shiny in holotype and specimen from San Cristobal Island and that from Ambon, microsculptured and dull in one specimen from Solomon Islands; posterior surface punctate (interspaces microsculptured, dull), transversely ridged in ventral third, all microareolate in specimen from San Cristobal Island. Hindcoxa dorsum with outer margin not carinate. Terga I and II conspicuously microareolate, with minute punctures that are many diameters apart on disk (Fig. 1256). Sternum II finely punctate throughout.

Setae silvery, erect on frons (about  $0.3 \times$  as long as midocellar diameter, about  $0.5 \times$  in specimen from Ambon), appressed on scutum and tergum I, on lower gena straight, curved apically,

about as long as  $0.5 \times$  midocellar diameter; not concealing integument on clypeus. Apical depressions of terga with inconspicuous silvery, setal fasciae.

Body all black, mandible dark brown except black basally.

♀.—Upper interocular distance equal to  $0.50 \times$  lower interocular distance; ocellocular distance equal to  $0.1\text{--}0.2 \times$  hindocellar diameter ( $0.6 \times$  hindocellar diameter in specimen from San Cristobal Island), distance between hindocelli equal to  $0.3\text{--}0.6 \times$  hindocellar diameter (Fig. 1254); eye height equal to  $1.08\text{--}1.12 \times$  distance between eye notches. Free margin of clypeal lamella rounded (Fig. 1251). Dorsal length of flagellomere I  $2.8\text{--}2.9 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 8.4–9.4 mm; head width 2.3–2.6 mm.

♂.—Upper interocular distance equal to  $0.54 \times$  lower interocular distance; ocellocular distance equal to  $0.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 1252). Dorsal length of flagellomere I  $2.5 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum VIII not emarginate apically (Fig. 1257). Genitalia: Figs. 1258, 1259. Length 5.6–6.7 mm; head width 1.7–2.1 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1260).—Ambon Island, Bismarek Archipelago, and Solomon Islands.

**RECORDS.**—INDONESIA: Ambon: Waai (1 ♀, BISH).

PAPUA NEW GUINEA: Bismarek Archipelago: New Britain: Yalom (1 ♀, ZMUC, holotype of *Pison novabritannicae*).

SOLOMON ISLANDS: Guadalcanal: Paripao (1 ♀, BISH), no specific locality (1 ♂, CAS; 1 ♀, RMNH). Malaita: Dala (1 ♀, BISH; 1 ♀, CAS), Malu'u (1 ♀, BMNH). Russel Islands: Pavuvu Island (1 ♀, CAS). San Cristobal: Wugiroga (1 ♀, BISH). Tulagi: no specific locality (1 ♀, BISH; 1 ♀, CAS; 3 ♀, 1 ♂, RMNH). Vella Lavella: Ulo Crater (1 ♀, BISH).



FIGURE 1260. Collecting localities of *Pison novabritannicae* Tsuneki.

### *Pison novaguineanum* Tsuneki

*Pison novaguineanum* Tsuneki, 1983c:49, ♀. Holotype: ♀, Papua New Guinea: no specific locality (MTM), examined. — Tsuneki, 1983:42 (in key to *Pison* of New Guinea).

**RECOGNITION.**— This species is extremely similar to *P. erimaense* and may be an individual form of it. See the key for differences, and also Recognition under *P. erimaense*.

**DESCRIPTION.**— Frons swollen mesally above antennal base, frontal punctures fine, averaging about one diameter apart; interspaces dull, microsculptured. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $3 \times$  as long as midocellar width. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures of medium size, most punctures about two or three diameters apart (some punctures less than one diameter apart); interspaces microsculptured, dull. Tegula slightly enlarged. Mesopleural punctures well defined, averaging about one diameter apart at center (some punctures up to two diameters apart). Postspiracular carina ill defined, about half as long as midocellar width; area between postspiracular carina and episternal sulcus with ill-defined sculpture. Metapleural sulcus costulate between dorsal and ventral



metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, punctures several diameters apart near midline, about one diameter apart laterally, with middle carina in shallow sulcus, interspaces unsculptured; side with well-defined punctures that are less than one diameter apart, interspaces merging into small ridges; posterior surface conspicuously, transversely ridged. Posteroventral forefemoral surface minutely punctate, punctures 1-2 diameters apart. Hindcoxal dorsum with outer margin sharply carinate; inner margin with well-defined tooth basally. Outer surface of hindtibia with evanescent spines. Punctures of tergum I several diameters apart between horizontal part and basal declivity. Sterna punctate throughout.

Setae silvery, subappressed on upper frons, appressed on scutum and tergum I, not concealing integument on clypeus; on lower gena subappressed, curved, about as long as midocellar diameter. Apical depressions of terga with silvery, setal fasciae.

Body all black, mandible dark brown preapically.

♀.—Upper interocular distance equal to  $0.74 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Free margin of clypeal lamella evenly arcuate (as in *erimaense*, see Fig. 1226). Dorsal length of flagellomere I  $2.9 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength; acetabular groove with two rows of punctures. Length 9.5 mm; head width 3.3 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION.**—Known from an unspecified locality in Papua New Guinea.

**RECORDS.**—**PAPUA NEW GUINEA:** Province unknown: "British New Guinea [now Papua New Guinea], Mazalán collector" (1 ♀, MTM, holotype of *Pison novaguineanum*, labeled *novaguineae* by the species author).

### *Pison oresbios* Pulawski, species nova

Figures 1261-1267.

**NAME DERIVATION.**—*Oresbios* is a Greek word meaning *living in or on mountains*; with reference to this species origin in Torricelli Mountains of New Guinea.

**RECOGNITION.**—*Pison oresbios* is the only New Guinean species with a red gaster combined with the second recurrent vein interstitial with the second intersubmarginal vein or nearly so. Additional recognition features are: clypeal lamella of equal length medially and laterally (Fig. 1261), mesopleural punctures markedly larger ventrally than dorsally (Fig. 1263), and tibiae without spines.

**DESCRIPTION.**—Frons dull, with well-defined, medium-sized punctures, punctures averaging less than one diameter apart (a few sublateral punctures below midocellus more than one diameter apart). Occipital carina joining hypostomal carina. Gena relatively narrow in dorsal view (Fig. 1262). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures conspicuous, of medium size, mostly less than one diameter apart (several posterolateral punctures more than one diameter apart); interspaces microsculptured. Tegula slightly enlarged. Mesopleural punctures fine dorsally but conspicuous ventrally (where punctures are more than one diameter apart), of varying size anterior of episternal sulcus; interspaces microsculptured (Fig. 1263). Postspiracular carina absent. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum transversely ridged, punctate between ridges (Fig. 1264); side punctate, punctures less than one



FIGURES 1261-1266. *Pison oresbios* Pulawski, sp. nov., female. (1261) Clypeus and mandibles; (1262) Head in dorsal view; (1263) Mesopleuron; (1264) Propodeal dorsum; (1265) Tergum VI in dorsal view; (1266) Body in lateral view.



diameter apart anteriorly, more than one diameter apart posteriorly, interspaces merging into ridges that are visible only from certain angles; posterior surface conspicuously transversely ridged, punctate between ridges. Posteroventral forefemoral surface minutely punctate, punctures varying from one to several diameters apart. Hindcoxal dorsum with outer margin obtusely carinate. Outer surface of all tibiae without spines. Punctures of tergum I averaging several diameters apart on horizontal part anterad of apical depression. Sternum II punctate throughout, punctures conspicuous except fine apically.

Setae pale golden on clypeus and lower frons, brown on upper frons, thorax, and propodeum; appressed on most of postocellar area, scutum, and tergum I; not concealing integument on clypeus; on lower gena suberect, straight, up to  $0.8 \times$  midocellar diameter. Apical depressions of terga with ill-defined, golden setal fasciae.

Head, thorax, and propodeum black, with the following ferruginous: clypeal lamella, scape, pedicel, flagellomeres I and II, and mandible (except apically). Femora black; foretibia ferruginous, midtibia ferruginous except black basally, hindtibia black except ferruginous apically; tarsi ferruginous. Gaster all ferruginous.

♀ (Fig. 1266).—Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7 \times$  hindocellar diameter; eye height equal to  $0.90 \times$  distance between eye notches. Free margin of clypeal lamella of equal length medially and laterally (Fig. 1261). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Tergum VI pointed (Fig. 1264). Length 9.8 mm; head width 2.3 mm.

♂.—Unknown.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1267).—Known from one locality in northwestern Papua New Guinea.

**RECORDS.**—**HOLOTYPE:** ♀, **PAPUA NEW GUINEA: Sandaun Province:** Mokai Village in Torricelli Mountains, 1-23 Jan 1959, W.W. Brandt (BISH).



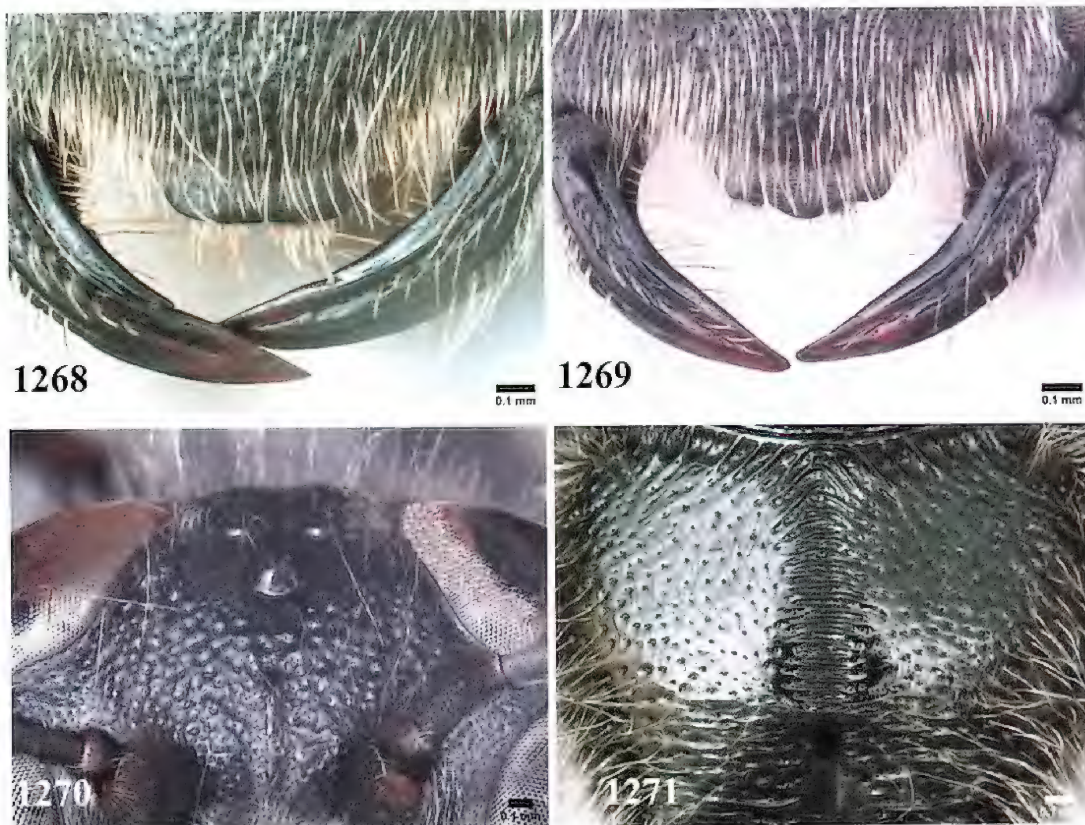
FIGURE 1267. Collecting locality of *Pison oresbios* Pulawski, sp. nov.

### *Pison pandambai* Pulawski, species nova

Figures 1268-1275.

**NAME DERIVATION.**—*Pandambai*, a locality in Papua New Guinea where I collected my first specimen of this species (that is now designated as the holotype).

**RECOGNITION.**—*Pison pandambai*, an all black species, has three submarginal cells and erect setae on tergum I and sternum II. Like *P. punctifrons* and *P. suspiciosum*, it has conspicuous, large punctures on the frons (some punctures equal to  $0.3 \times$  midocellar diameter), and like *P. punctifrons*, the propodeum without a longitudinal carina between the spiracle and the gastropodeal articulation, and the hindcoxal dorsum with a conspicuous tooth at the base of the inner carina. Unlike these two species, the clypeal lamella of the female is roughly truncate (rather than arcuate or roundly triangular) and the clypeal lamella of the male is tridentate or truncate (the middle tooth can be divided), whereas acutely angulate in *P. punctifrons*. Unlike most *P. suspiciosum*, the apical depression of tergum I is all punctate (rather than impunctate mesally).

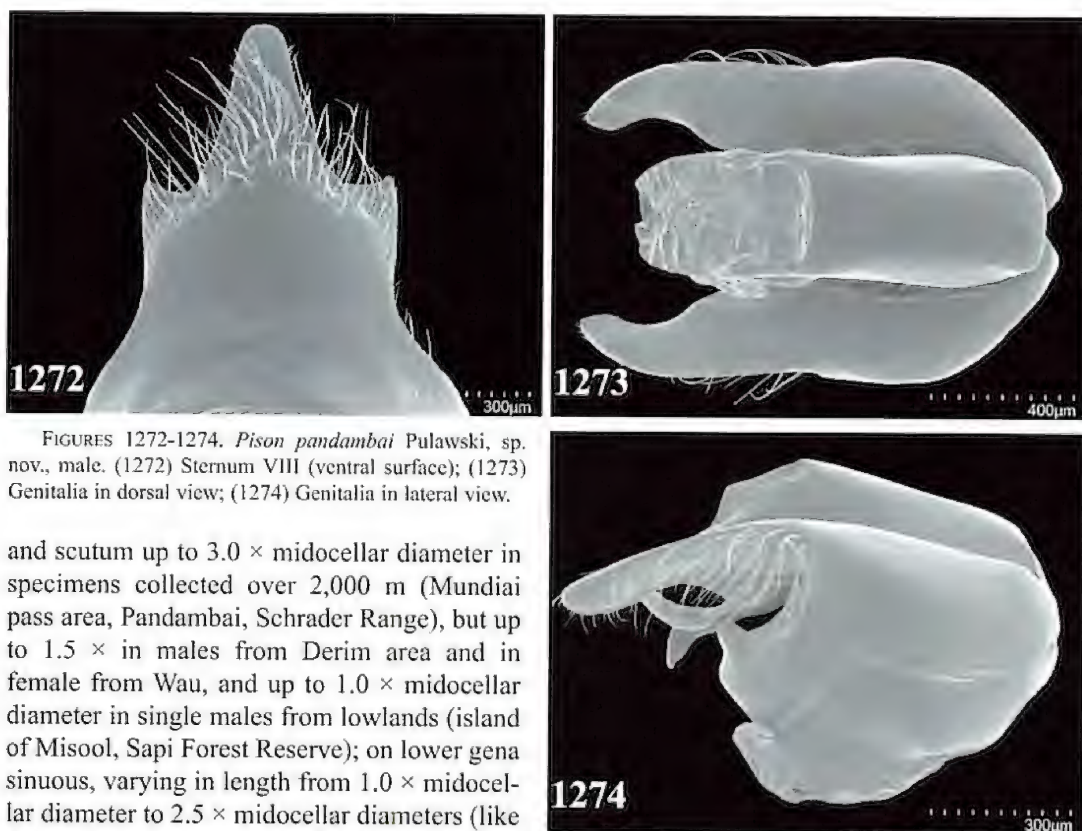


FIGURES 1268-1271. *Pison pandambai* Pulawski, sp. nov. (1268) Female clypeus and mandibles; (1269) Male clypeus and mandibles; (1270) Upper frons of female; (1271) Propodeal dorsum of female.

**DESCRIPTION.**— Frons dull, coarsely punctate, punctures less than one diameter apart, some punctures equal to  $0.3 \times$  midocellar diameter (Fig. 1270). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $2.5 \times$  as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, several diameters apart at least near center; interspaces aciculate. Tegula enlarged. Mesopleural punctures well defined, averaging more than one diameter apart to less than one diameter apart near center; interspaces unsculptured. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum punctate, with evanescent ridges visible from certain angles over most of surface, and with well-defined short, longitudinal ridges basally, punctures averaging 2-3 to several diameters part, but less than one diameter apart near lateral margin (Fig. 1271); side punctate, punctures no more than one diameter apart, also ridged in some specimens; posterior surface with well-defined transverse ridges, punctate between ridges. Posteroventral forefemoral surface with punctures averaging about 2-3 diameters apart. Hindcoxal dorsum with inner carina produced into conspicuous tooth basally. Punctures of tergum I, anterior of apical depression, several diameters apart. Punctures of sternum II several diameters apart mesally in most specimens, but about 2-3 diameters apart in specimen from Misool.

Setae silvery, erect on postocellar area, scutum, and tergum I; setal length on postocellar area





FIGURES 1272-1274. *Pison pandambai* Pulawski, sp. nov., male. (1272) Sternum VIII (ventral surface); (1273) Genitalia in dorsal view; (1274) Genitalia in lateral view.

and scutum up to  $3.0 \times$  midocellar diameter in specimens collected over 2,000 m (Mundiai pass area, Pandambai, Schrader Range), but up to  $1.5 \times$  in males from Derim area and in female from Wau, and up to  $1.0 \times$  midocellar diameter in single males from lowlands (island of Misool, Sapi Forest Reserve); on lower gena sinuous, varying in length from  $1.0 \times$  midocellar diameter to  $2.5 \times$  midocellar diameters (like those on scutum); not concealing integument on clypeus. Apical depressions of terga with ill-defined, silvery setal fasciae.

Body all black.

♀.— Upper interocular distance equal to  $0.56\text{--}0.60 \times$  lower interocular distance; ocellocular distance equal to  $1.0\text{--}1.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7\text{--}0.9 \times$  hindocellar diameter; eye height equal to  $0.92\text{--}0.94 \times$  distance between eye notches. Free margin of clypeal lamella truncate (Fig. 1268). Dorsal length of flagellomere I  $2.2\text{--}2.34 \times$  apical width, of flagellomere IX  $1.2\text{--}1.4 \times$  apical width. Mandible: trimmal carina with minute incision at about two thirds of length. Length 9.1–10.0 mm; head width 2.9–3.1 mm.

♂.— Upper interocular distance equal to  $0.64\text{--}0.66 \times$  lower interocular distance; ocellocular distance equal to  $0.9\text{--}1.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6\text{--}0.7 \times$  hindocellar diameter; eye height equal to  $1.00\text{--}1.02 \times$  distance between eye notches. Free margin of clypeal lamella tridentate (Fig. 1269), middle tooth divided in specimens from Wau area, truncate in one specimen. Dorsal length of flagellomere I  $2.0\text{--}2.6 \times$  apical width, of flagellomere X  $1.1\text{--}1.4 \times$  apical width. Sternum VIII with rounded apical projection (Fig. 1272). Genitalia: Figs. 1273, 1274. Length 8.0–11.3 mm; head width 2.5–3.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1275).— Island of New Guinea and the adjacent island of Misool.

**RECORDS.**— HOLOTYPE: ♀, PAPUA NEW GUINEA: Madang Province: Pandambai 6 air km W Bundi at  $5^{\circ}38'S$   $145^{\circ}11'E$ , 2330 m alt., 10–13 May 1988, W.J. Pulawski (CAS).

PARATYPES: INDONESIA: Misool Island: Fakal, 0–70 m. alt., 20 Sept 1948, M.A. Lieftink (1 ♂, RMNH).

PAPUA NEW GUINEA: Madang Province: 5 air km NE Mundiai Pass at  $5^{\circ}46'S$   $145^{\circ}09'E$ , 2500 m alt.,

W.J. Pulawski, 14 May 1988 (8 ♀, 1 ♂, CAS) and 17 May 1988 (1 ♀, 1 ♂, CAS); same locality and collector as holotype: 15 May 1988 (1 ♀, CAS), 18 May 1988 (1 ♀, CAS); Sapi Forest Reserve 30 km W Madang at 5°12'S 145°30'E, 19 Feb 1987, W.J. Pulawski (1 ♂, CAS); Schrader Range 3 km NE Simbai, 2250 m alt., 12 Mar 1989, D.H. Kavanaugh, G.E. Ball, N.D. Penny, and P.A. Meyer (1 ♀, CAS). **Milne Bay Province:** Woodlark Island (= Murua Island): Kulumadau Hill, 19-22 March 1957, W.W. Brandt (1 ♂, BISH). **Morobe Province:** 10 km S Derim at 6°13'S 147°06'E, 1850 m alt., Mar 1987, A. Aptroot (2 ♂, RMNH); Nami Creek 6 km W Wau, 10 June 1962, J Sedlacek (1 ♂, BISH); Wau: Mount Kaindi, 2100-2300 m alt., 14 Sept 1972, collector unknown (1 ♀, RMNH).



FIGURE 1275. Collecting localities of *Pison pandambai* Pulawski, sp. nov.

### *Pison pistillum* Menke

Figures 1276-1287.

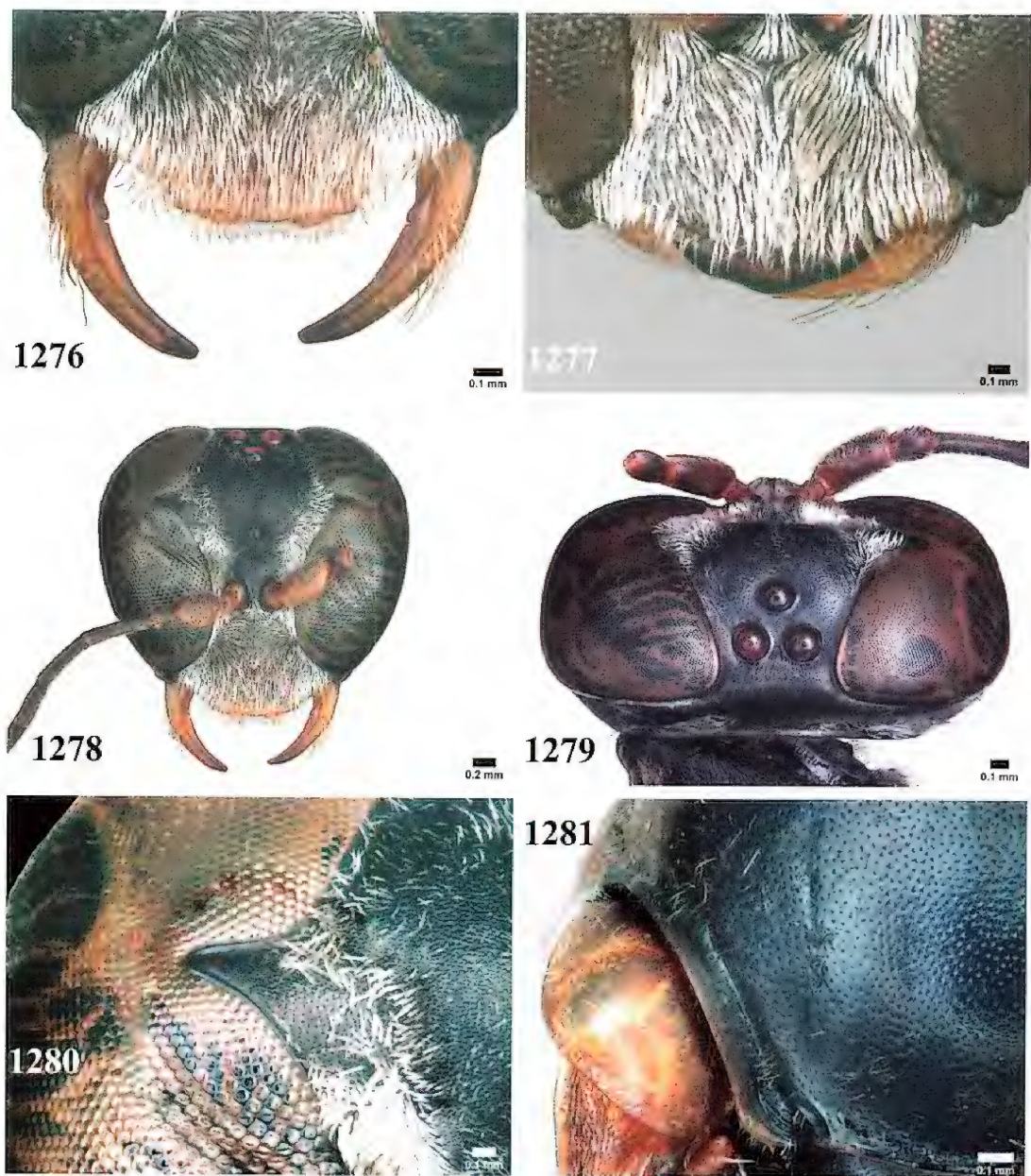
*Pison pistillum* Menke, 1988:91, ♀. Holotype: ♀, Papua New Guinea: Western Highland Province: Bayier River (AEI), not examined.

**RECOGNITION.**—*Pison pistillum* shares with *P. woji* (whose male is unknown) the combination of the second recurrent vein ending on submarginal cell II near its midlength (Fig. 1287) and a conspicuously elongate gastral segment I (Fig. 1283): length of tergum I  $2.0 \times$  apical width, distance between gastropodopodal articulation and spiracle  $1.7 \times$  distance between spiracles. As in *P. woji*, the ommatidia are markedly larger in the lower half of the eye than those in the dorsal half (Fig. 1278). The female is unique in having the eye emargination roundly acute rather than rounded (Fig. 1280). The species differs from *P. woji* by a number of characters in addition to the eye emargination: clypeus (Fig. 1276) with a well defined median lobe (lobe absent in *P. woji*), the middle supraantennal carina present (absent in *P. woji*), the dorsal length of flagellomere I  $4.0-4.5 \times$  the apical width in the female and  $3.5 \times$  in the male (rather than  $1.8-1.9 \times$  in *woji*), the forewing media (Fig. 1282) diverging from M+Cu before crossvein cu-a (in *P. woji* diverging at cu-a or shortly beyond it), sternum II impunctate apicomesally (punctate throughout in *P. woji*), the gaster black (gastrol segment I ferruginous in *P. woji*), the dorsomedian part of the female clypeus elevated, separated by an angle from the ventral portion (no elevation in *P. woji*), female tergum VI carinate apically (not carinate in *P. woji*), and length of 10.0-10.5 mm in the female and 7.3 mm in the male (rather than 5.4-6.5 mm).

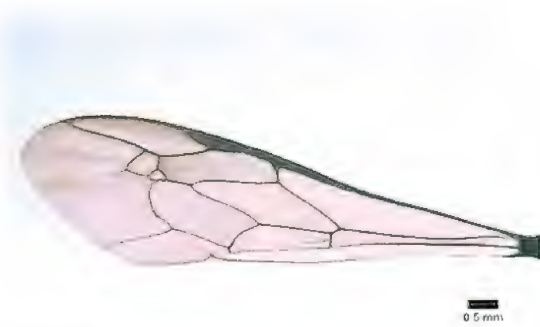
Menke (1988) thought that the shape of the submarginal cell III separates these two species. Indeed, his picture of the holotype forewing shows a submarginal cell III with the foremargin markedly shorter than the hindmargin. In the specimen from the New Britain, however, the foremargin of the submarginal cell III is only slightly shorter than the hindmargin (Fig. 1282), exactly as in *P. woji*.

**DESCRIPTION.**—Frons dull, conspicuously aciculate, and with evanescent, minute punctures averaging about one diameter apart. Distance between antennal socket and orbit smaller than socket diameter in female, equal to socket diameter in male. Occipital carina in female slightly expanded at ventral end. Gena narrow in dorsal view (Fig. 1279). Ommatidia becoming larger toward inner eye margin, larger in ventral eye half than those in dorsal half (Fig. 1278); eye notch roundly acute in female (Fig. 1280), less distinctly so in male. Labrum semicircularly emarginate





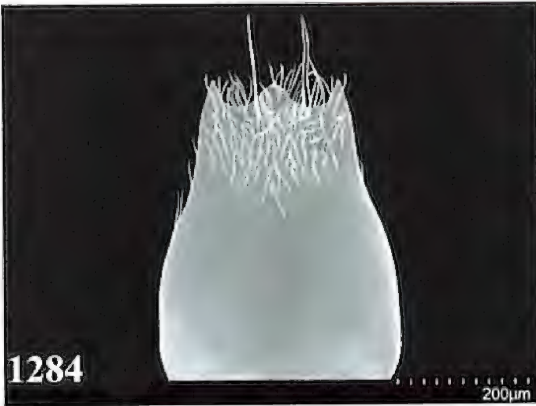
FIGURES 1276-1281. *Pison pistillum* Menke. (1276) Female clypeus and mandibles; (1277) Male clypeus; (1278) Female head in frontal view; (1279) Female head in dorsal view; (1280) Eye notch of female; (1281) Female tegula and adjacent scutum.



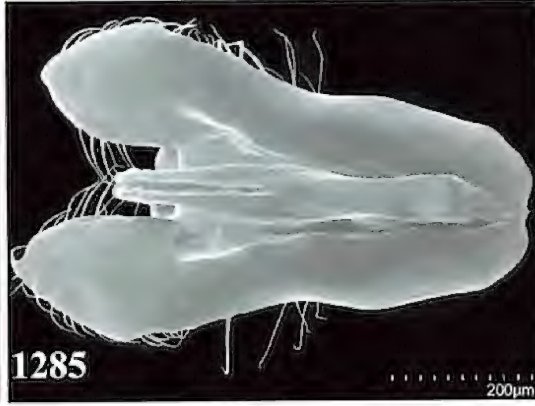
1282



1283



1284



1285



1286

FIGURES 1282-1286. *Pison pistillum* Menke. (1282) Left forewing of female (arrow show crossvein cu-a); (1283) Female tergum I in dorsal view; male: (1284) Sternum VIII (ventral surface); (1285) Genitalia in dorsal view; (1286) Genitalia in lateral view.

apically. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, with very short longitudinal ridges adjacent to posterior margin; scutal punctures fine, about 1-2 diameters apart. Tegula somewhat enlarged. Mesopleural punctures minute, about one diameter apart; interspaces unsculptured.

Postspiracular carina present, about twice as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; enclosure minutely punctate, punctures several diameters apart; lateral portion of dorsum (between enclosure and longitudinal carina) with larger punctures that are 1-2 diameters apart; side microscopically punctate, punctures several diameters apart; posterior surface minutely punctate, punctures less than one diameter apart. Second recurrent vein ending on submarginal cell II near its midlength; media diverging from M+Cu before crossvein cu-a (Fig. 1282). Posteroventral forefemoral surface microscopically, closely punctate. Hindcoxal dorsum with outer margin not



carinate. Gastral segment I narrow in basal half, broadened in apical half, conspicuously elongate (Fig. 1283): length of tergum I  $2.0 \times$  apical width in female,  $1.9 \times$  in male, distance between gastropodeal articulation and spiracle  $1.7 \times$  distance between spiracles in female,  $1.4 \times$  in male; punctures minute, about one diameter apart. Sternum II minutely punctate, impunctate apicomesally.

Setae silvery, appressed on frons, postocellar area, lower gena, scutum, and tergum I; nearly completely concealing integument on clypeus. Apical depressions of terga without setal fasciae; with silvery appressed vestiture at anterolateral corner of tergum II and near lateral margin of terga III and IV.

Head, thorax, propodeum, and gaster black except following yellow brown: scapal venter, pedicel venter, ventral two-thirds of clypeus in female, basal half of mandible, palpi, and tegula, also hindmargin of pronotal lobe in holotype. Legs in holotype yellow brown except black hindtarsomeres III-V; in female from New Britain coxae partly, trochanters and very base of femora yellow brown, most of femora black, foretibia mostly yellow brown, mid- and hindtibiae black except yellow brown basally and apically, and tarsi yellowish; in male from Solomon Islands forecoxa and all femora black, tibiae largely black, partly brown, and tarsi yellow; spurs whitish.

♀.—Upper interocular distance equal to  $0.96\text{--}1.00 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.3 \times$  hindocellar diameter; eye height equal to  $1.26 \times$  distance between eye notches. Free margin of clypeal lamella obtusely tridentate in holotype, almost straight in specimen from New Britain (Fig. 1276); dorsomedian part of clypeus elevated, separated by angle from ventral portion. Dorsal length of flagellomere I  $4.0\text{--}4.5 \times$  apical width, of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with small obtuse tooth near base, without incision. Tergum VI with median carina apically. Length 10.0–10.5 mm; head width 1.8 mm.

♂.—Upper interocular distance equal to  $0.80 \times$  lower interocular distance; ocellocular distance equal to  $0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5 \times$  hindocellar diameter; eye height equal to  $1.28 \times$  distance between eye notches. Free margin of clypeal lamella arcuate, with ill-defined, short median point (Fig. 1277). Dorsal length of flagellomere I  $3.5 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII with apical margin projecting mesally, concave on each side of projection (Fig. 1284). Genitalia: Figs. 1285, 1286. Length 7.3 mm; head width 1.9 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1287).—Papua New Guinea including New Britain, and Solomon Islands.

**RECORDS.**—**PAPUA NEW GUINEA:** New Britain: Vunabakan 10 km E Keravat (1 ♀, BISH, determination by A. Menke). **Western Highland Province:** Bayer River (Menke, 1988).

**SOLOMON ISLANDS:** Santa Isabel Island: Kolotuve (1 ♂, BISH).



FIGURE 1287. Collecting localities of *Pison pistillum* Menke

PISON OF THE PACIFIC ISLANDS

Key for Species Identification

1. Tergum I and sternum II with erect setae (Fig. 916); frons coarsely punctate, punctures one diameter or less apart (Fig. 911) ..... 2
  - Gaster with appressed setae (setae erect on basal declivity of tergum I in many *P. insulare*); frons either finely or conspicuously punctate (when conspicuously punctate, then punctures 1-2 diameters apart) ..... 4
2. Inner margin of hindcoxa with conspicuous, tooth-like projection basodorsally; apical depression of tergum I finely punctate throughout. Male sternum VIII with median projection apically (Fig. 918) ..... *punctifrons* F. Smith, p. 373
  - Inner margin of hindcoxa at most with inconspicuous projection basodorsally; apical depression of tergum I in many specimens unsculptured. Male: sternum VIII deeply emarginate apically (Fig. 1366) ..... 3
3. Scutum with interspaces microsculptured, dull. Female: length 9.5-11 mm. Male: clypeal lamella truncate apically, truncation minimally concave apically (Fig. 1370). Chichijima Island. . . . .*tosawai* Yasumatsu, p. 564
  - Scutum with interspaces unsculptured, shiny. Female: length 6.0-8.5 mm. Male: clypeal lamella obtusely pointed (Fig. 1364) ..... *suspiciosum* F. Smith, p. 558
4. Second recurrent vein received near middle of second submarginal cell (Fig. 1282) ..... 5
  - Second recurrent vein interstitial with second intersubmarginal vein or nearly so ..... 6
5. Gaster sessile; eye emargination rounded; ocellocular distance equal to  $0.6-1.1 \times$  hindocellar diameter; propodeal dorsum ridged in most specimens. . . . . *argentatum* Shuckard, p. 64
  - Tergum I pedunculate, its length about  $2.0 \times$  apical width (Fig. 1283); eye emargination obtusely acute (Fig. 1280); ocellocular distance equal to  $0.3-0.5 \times$  hindocellar diameter; propodeal dorsum minutely punctate. . . . . *pistillum* Menke, p. 526
6. Setae of lower gena straight or curved apically, up to about  $0.7 \times$  midocellar diameter ..... 7
  - Setae of lower gena sinuous,  $1.0-1.5 \times$  as long as midocellar diameter, at least near occipital carina ..... 8
7. Mesopleuron and propodeal side unsculptured between punctures; wing membrane conspicuously infumate (Fig. 1340); terga in specimens from Guam without silvery, apical fasciae or only tergum I with such fascia ..... *oakleyi* Krombein, p. 549
  - Mesopleuron and propodeal side microsculptured between punctures (unsculptured in some specimens from Koror Island); wing membrane slightly infumate; terga with silvery, apical fasciae ..... *westwoodii* Shuckard, p. 487
8. Setae of head, thorax, and propodeum black; gastral terga without silvery, setal fasciae ..... 9
  - Setae of head, thorax, and propodeum silvery, brownish on scutum in *P. ponape* and some *P. marginatum*; at least tergum I with silvery, setal fascia in most specimens, but all terga not fasciate in some ..... 10
9. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with well defined, complete middle carina in deep sulcus; posterior surface transversely ridged. . . . . *esakii* Yasumatsu, p. 532
  - Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with inconspicuous middle carina in



- shallow sulcus (carina in some specimens extending only to midlength of dorsum); posterior surface unridged in dorsal half ..... *nigellum* Krombein, p. 543
10. Sternum II densely punctate mesally, punctures up to 3-4 diameters apart ..... 11  
 – Sternum II impunctate or sparsely punctate at least mesally ..... 12
11. Terga I-IV with silvery, apical fasciae; punctures of upper frons 1-2 diameters apart .....  
 ..... *marginatum* F. Smith, p. 267  
 – At most terga I and II with silvery, apical fasciae (all terga nonfasciate in some specimens); punctures of upper frons about 2-3 diameters apart ..... *ponape* Krombein, p. 551
12. Apex of marginal cell and of submarginal cell III equidistant from wing apex (Fig. 1318) ...  
 ..... *mariannense* Yasumatsu, p. 541  
 – Apex of marginal cell markedly closer to wing apex than that of submarginal cell III. .... 13
13. Scutal setae suberect, about as long as  $0.7-1.0 \times$  midocellar diameter; mandible in many specimens with abductor ridge; tergum I in most specimens with erect setae on declivous basal area (Fig. 1308); mesopleural punctures near center averaging 2-3 to several diameters apart in vast majority of specimens; propodeum without longitudinal carina separating side from dorsum and posterior surface ..... *insulare* F. Smith, p. 537  
 – Scutal setae appressed or subappressed, markedly shorter than midocellar diameter; tergum I with appressed setae, mesopleural punctures less than one diameter apart to several diameters apart, and propodeum with or without longitudinal carina separating side from dorsum and posterior surface ..... 14
14. Most punctures of propodeal dorsum and side many diameters apart (Figs. 1296, 1297); propodeum without longitudinal carina separating side from dorsum and posterior surface; apical depressions of female terga without setal fasciae; punctures of mesopleuron in most specimens several diameters apart at center (Fig. 1295), about two diameters in some. ....  
 ..... *glabrum* Kohl, p. 534  
 – Most punctures of propodeal side less to more than one diameter apart; propodeum in many specimens with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent or absent in some specimens); at least tergum I with silvery apical setal fascia (fascia well defined to inconspicuous); punctures of mesopleuron less than one to about two diameters apart ..... 15
15. Entire posterior propodeal surface with well-defined transverse ridges; only tergum I with silvery apical fascia ..... *trukense* Yasumatsu, p. 565  
 – Posterior propodeal surface unridged in dorsal half (only punctate); at least terga I and II with silvery apical fasciae ..... 16
16. Propodeal dorsum with punctures less than one diameter apart, in some specimens punctures several diameters apart adjacent to midline (Fig. 1356). Male: sternum VIII shallowly, broadly emarginate apically (Fig. 1358). Widely distributed in Pacific Islands .....  
 ..... *reichingeri* Kohl, p. 554  
 – Propodeal dorsum with punctures more than one diameter apart (Fig. 1333). Male: sternum VIII truncate or insignificantly emarginate apically (Fig. 2334). New Caledonia. ....  
 ..... *novocaledonicum* Krombein, p. 546

## Species Descriptions

N.B. The species shared with Australia are described under *Pison* of Australia above.

*Pison novabritannicae*, common to New Britain and Solomon Islands, and *Pison pistillum*, common to New Guinea and Solomon Islands, are described under *Pison* of New Guinea above.

*Pison esakii* Yasumatsu

Figures 1288-1292.

As *Pison* sp.: Fullaway, 1913:283 (Guam) and Swezey, 1942:185 (Guam), corrected to *Pison esakii* by Krombein, 1949b:401.

*Pison esakii* Yasumatsu, 1937b:129, ♀. Holotype: ♀, Mariana Islands: Island of Rota (ELKU), examined. — Yasumatsu, 1939:83 (in key to *Pison* of eastern Asia, in checklist of *Pison* of Japanese Empire), Krombein, 1949b:384 (in key to Sphecidae of Micronesia), 401 (diagnostic characters; Mariana Islands); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 139 (bibliographic references; Mariana Islands); Tsuneki, 1968b:21 (Mariana Islands, description of ♂); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae).

**RECOGNITION.**— *Pison esakii* and *P. nigellum* are the only Pacific Islands species with black setae on the upper frons, gena (Fig. 1290), thorax, and propodeum (Fig. 1291). Subsidiary recognition features are: punctures 2-3 diameters apart on frons, several diameters apart on scutal disk and propodeal dorsum, setae of lower gena sinuous, about as long as  $1.5 \times$  midocellar width and appressed on tergum I, ocellocular distance about  $0.3 \times$  hindocellar diameter, wing membrane black, and gastral terga without silvery, apical fasciae. Unlike *P. nigellum*, the propodeum of *P. esakii* has a longitudinal carina separating the dorsum from the side (carina absent in *P. nigellum*), a well-defined median carina within a well-defined sulcus (Fig. 1291) whereas the carina and sulcus are inconspicuous in *P. nigellum*, and the propodeal posterior surface with conspicuous, transverse ridges (unridged in dorsal half in *P. nigellum*).

**DESCRIPTION.**— Frons dull, microsculptured, with well-defined punctures that average 2-3 to several diameters apart (Fig. 1289). Labrum minimally shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures fine but well defined, several diameters apart (about one diameter apart near to foremargin). Tegula not enlarged. Mesopleural punctures well defined, averaging several diameters apart at center. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter; integument narrowly depressed between postspiracular carina and episternal sulcus. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending posterad from spiracle area but not reaching gastral socket; dorsum unridged, minutely punctate (punctures several diameters apart except about one diameter apart laterally), with well-defined median carina in well-defined sulcus; side finely punctate, punctures about one diameter apart, interspaces merging into fine ridges well visible from several angles; posterior surface conspicuously, transversely ridged, minutely punctate between ridges. Posteroventral forefemoral surface finely punctate, punctures many diameters apart. Hindcoxal dorsum with outer margin sharply carinate in posterior half. Horizontal part of tergum I, terga II-IV, and sternum II with microscopic punctures that are many diameters apart, interspaces unsculptured, shiny.

Setae black on the head (Fig. 1290), thorax, and propodeum (Fig. 1291) except silvery on lower frons laterally and on clypeus laterally, erect on upper frons, postocellar area, scutum (here about as long as one midocellar diameter), not concealing integument on clypeus; setae of lower gena sinuous, about as long as  $1.5 \times$  midocellar diameter. Apical depressions of terga without setal,





FIGURES 1288-1291. *Pison esakii* Yasumatsu, female. (1288) Clypeus and mandibles; (1289) Upper frons; (1290) Head in dorsal view; (1291) Propodeal dorsum.

FIGURE 1292. Collecting localities of *Pison esakii* Yasumatsu.



silvery fasciae, terga I and II glabrous (except tergum II laterally).

Body all black except mandible ferrugineous in apical third. Wing membrane black.

♀.— Upper interocular distance equal to  $0.50-0.52 \times$  lower interocular distance; ocellular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6-0.7 \times$  hindocellar diameter; eye height equal to  $1.04-1.06 \times$  distance between eye notches. Free margin of clypeal lamella arcuate (Fig. 1288). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with small incision shortly before midlength. Length 10.6-10.8 mm; head width 2.7-2.9 mm.

♂ (from Tsuneki, 1968b). — Free margin of clypeal lamella acutely angulate. Dorsal length of flagellomere I  $2.4 \times$  apical width. Length 8.5 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1292).— Guam and the island of Rota in the Mariana Archipelago.

**RECORDS.**— **MARIANA ISLANDS:** Guam: "Pt. R. Tidian" (1 ♀, CAS, determined by K. Krombein), no

specific locality (2 ♀, 1 ♂, BISH). **Island of Rota:** Tatâcho-Sonson (1 ♀, ELKU, holotype of *Pison esakii*), no specific locality (1 ♀, CAS).

### *Pison glabrum* Kohl

Figures 1293-1303.

*Pison glabrum* Kohl, 1908:309, ♀. Holotype by monotypy: ♀, Samoa: Upolu (NHMW), examined. – Turner, 1916b:626 (diagnostic characters); Perkins and Cheesman, 1928:6 (listed from Samoa), 26 (Samoa, description of ♂); Yasumatsu, 1953:134 (in list of *Pison* of Pacific Islands); R. Bohart and Menke, 1976:335 (in checklist of world Sphecidae); Dollfuss, 1989:11 (type material in NHMW); *nec* Naumann, 1990a:24 and Smithers, 1998:46 (= *Pison laeve*); Kami and Miller, 1998:57 (in checklist of Samoan insects).

**STATUS OF TYPE MATERIAL.**— In the original description, Kohl did not specify the number of specimens examined, but his expression “Bei dem einzigem Stück ...” [= “in the only exemplar”] demonstrates that he had only one. This specimen, therefore, is the holotype by monotypy.

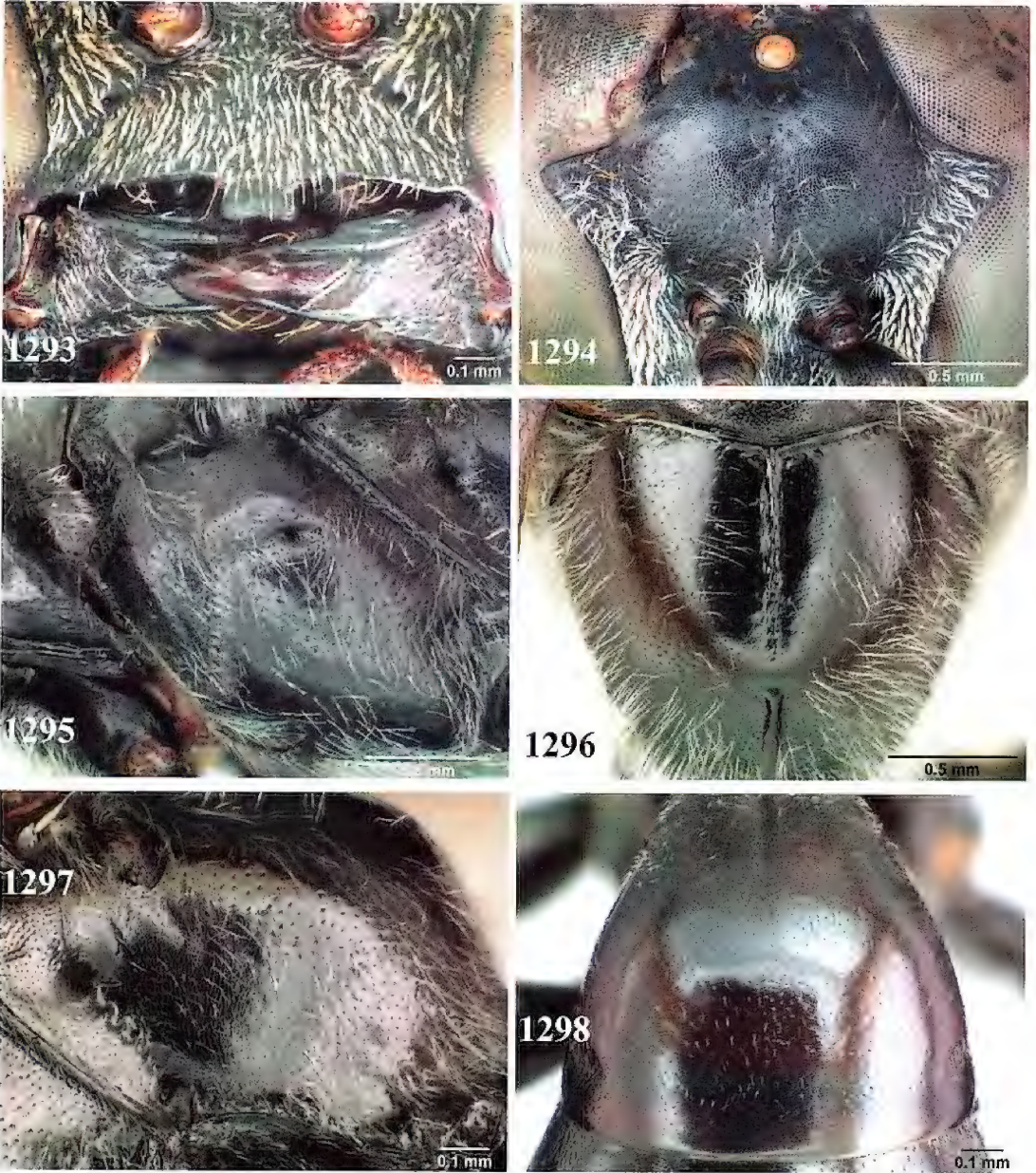
**RECOGNITION.**— *Pison glabrum* closely resembles *P. laeve* in having an unsculptured, sparsely punctate mesopleuron and propodeal dorsum and side (propodeum without the longitudinal carina separating the dorsum and side), and the ocellocular distance equal to  $0.3 \times$  hindocellar diameter. It differs from *P. laeve* in having the scutal flange the usual shape (not expanded), the posteroventral forefemoral punctures relatively well defined (rather than microscopically small), the microscopic punctures on the disk of terga I and II many diameters apart (rather than a few diameters), sternum II mostly or all impunctate (rather than sparsely punctate throughout), and female terga without silvery, apical fasciae (rather than fasciate).

Also similar is *Pison insulare*, from which *P. glabrum* differs in having the setae appressed on scutum and tergum I, impunctate apical depressions of terga I-IV, and in lacking silvery setae on terga. In *P. insulare*, the setae are erect on the scutum and in most specimens on the basal part of tergum I, the apical depressions of at least terga I and II are microscopically punctate and covered with silvery, setal fasciae.

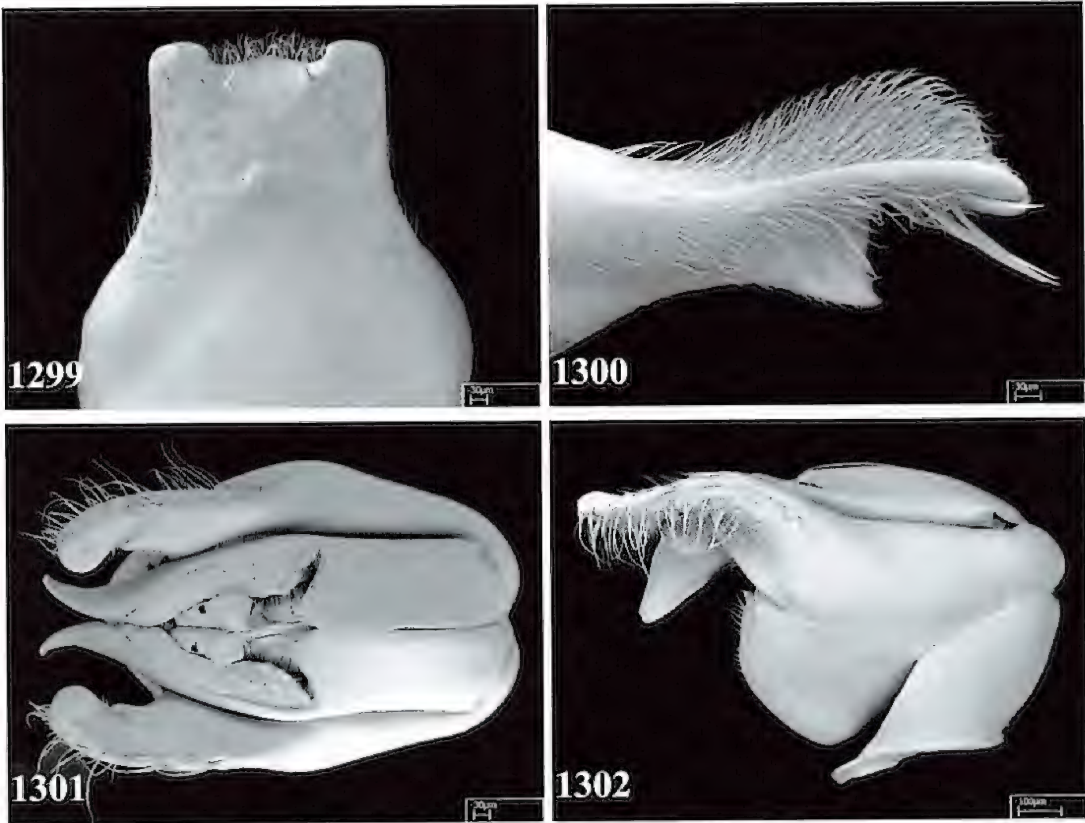
**DESCRIPTION.**— Frons microareolate, slightly shiny, with well defined punctures, most punctures many diameters apart (Fig. 1294). Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures averaging several diameters apart, interspaces minutely microsculptured. Tegula enlarged. Mesopleural punctures in most specimens several diameters apart at center (Fig. 1295), about two diameters in specimen from Moorea Island. Postspiracular carina present, about twice as long as midocellar diameter. Metapleural sulcus conspicuously costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum with minute punctures that are many diameters apart, unsculptured between punctures, lateral punctures larger in holotype, averaging 2-3 diameters apart (Fig. 1296); side finely microsculptured, microscopically punctate, punctures many diameters apart, larger posteriorly, averaging 2-3 diameters apart (Fig. 1297); posterior surface punctate except ridged in ventral third. Posteroventral forefemoral surface microsculptured, with a few, sparse punctures. Hindcoxal dorsum with outer margin carinate in distal half. Punctures of tergum I microscopic, several diameters apart, apical depressions of terga I-V impunctate (except punctate laterally). Sterna II and III impunctate except for several punctures posterolaterally.

Setae suberect, oriented ventrad on upper frons (mostly about as long as midocellar diameter, uppermost setae longer than midocellar diameter); appressed on scutum and tergum I; erect, slight-





FIGURES 1293-1298. *Pison glabrum* Kohl (holotype female and male). (1293) Male clypeus obliquely from below; (1294) Upper frons of female; (1295) Female mesopleuron; (1296) Propodeal dorsum of female; (1297) Propodeal side of female; (1298) Female tergum I.



FIGURES 1299-1302. *Pison glabrum* Kohl, male. (1299) Sternum VIII (ventral surface); (1300) Sternum VIII in lateral oblique view; (1301) Genitalia in dorsal view; (1302) Genitalia in lateral view.

ly sinuous on lower gena (length about  $1.5 \times$  midocellar diameter); not concealing integument on clypeus. Terga sparsely setose (practically asetose in female), apical depressions in female without setal fasciae, in male with evanescent fasciae.

Body all black, wing membrane infumate.

♀.—Upper interocular distance equal to  $0.52 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (exactly as in *P. laeve*, see Fig. 560). Dorsal length of flagellomere I  $2.4 \times$  apical width, of flagellomere IX  $1.5 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Length 8.2-9.0 mm; head width 2.4-2.6 mm.

♂.—Upper interocular distance equal to  $0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.8 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7 \times$  hindocellar diameter; eye height equal to  $1.10 \times$  distance between eye notches. Free margin of clypeal lamella straight with rounded median point, slightly convex on each side of point, slightly concave laterally (Fig. 1293). Flagellomeres III-VIII slightly convex ventrally. Dorsal length of flagellomere I  $2.4 \times$  apical width, of flagellomere X  $1.7 \times$  apical width. Sternum VIII with prominence, shallowly, broadly emarginate apically (Fig. 1299), in oblique lateral view (Fig. 1300). Genitalia: Figs. 1301, 1302.

GEOGRAPHIC DISTRIBUTION (Fig. 1303).— Federated States of Micronesia, Samoa and also



Moorea and Austral Islands in French Polynesia.

**RECORDS.— FEDERATED STATES OF MICRONESIA:** Pohnapei: Jokai Island (1 ♀, BISH).

**FRENCH POLYNESIA:** Austral Islands: Rurutu Island: Moera (1 ♂, BISH). **Moorea:** base of Mount Tohivea: Belvedere Trail (1 ♀, BISH, as Tohiheca).

**SAMOA:** no specific locality (1 ♀, NHMW, holotype of *Pison glabrum*). **Savaii:** no specific locality (Perkins and Cheesman, 1928). **Tutuila:** Amouli (1 ♀, CAS), Aua-Afono Trail (2 ♀, BISH), Fagasa (1 ♀, BISH), Leone Auila (1 ♀, BISH), Leone Aulau Trail (1 ♀, BISH), no specific locality (1 ♀, CAS). **Upolu:** Mount Vaea (1 ♂, BISH), Tuafu (1 ♀, 1 ♂, BMNH).



FIGURE 1303. Collecting localities of *Pison glabrum* Kohl.

### *Pison insulare* F. Smith

Figures 1304-1313.

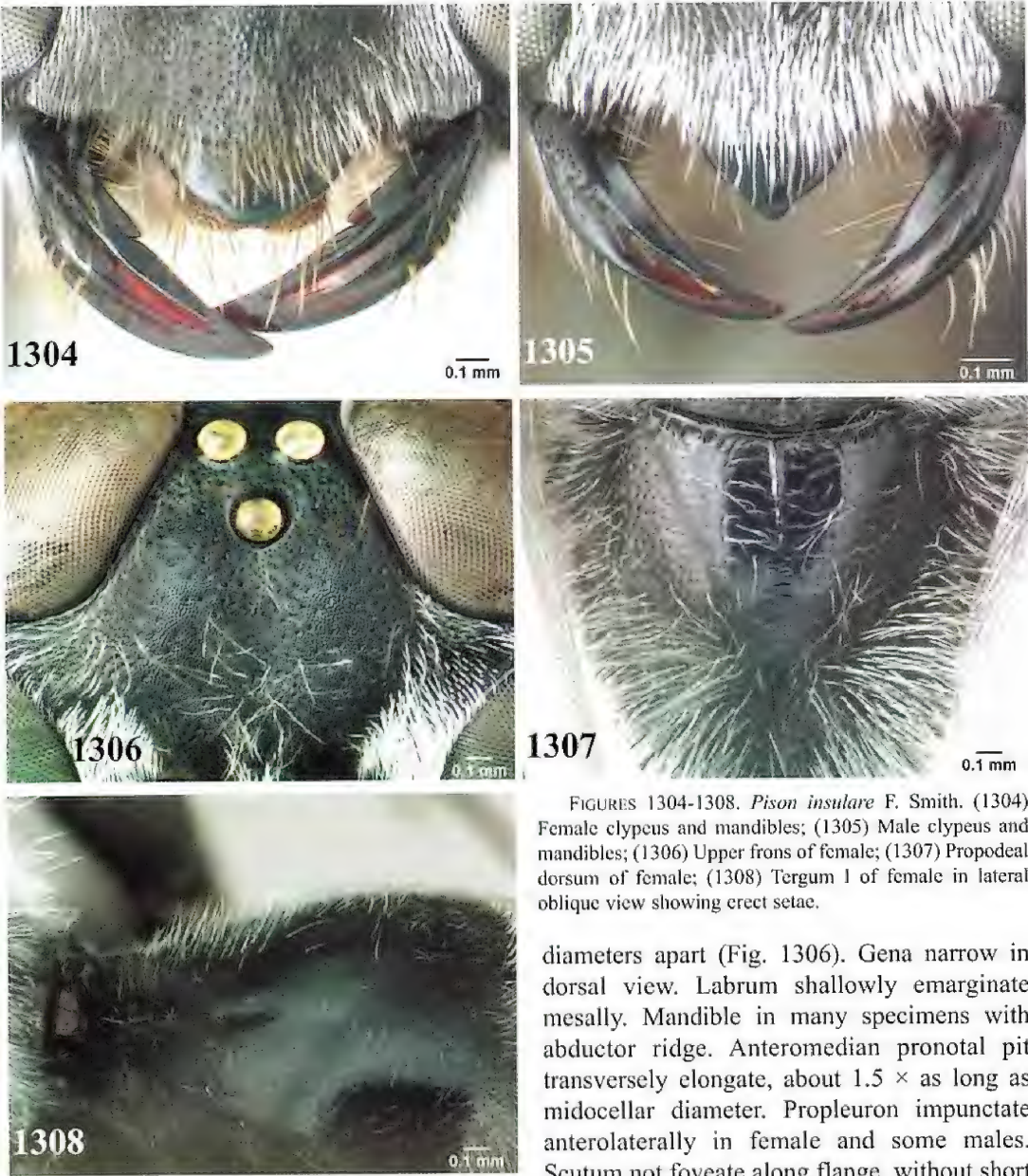
*Pison insulare* F. Smith, 1869:297, ♀ (as *insularis*, incorrect original termination). Lectotype: ♀, New Hebrides, now Vanuatu: no specific locality (BMNH), **present designation**, examined. — Kohl, 1885:187 (in checklist of world *Pison*); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Turner, 1908:510 (comparison with *Pison priscum*), 1916b:626 (diagnostic characters); Cheesman, 1937:203 (additional description; Vanuatu); *nec* F. Williams, 1945:442 (= *Pison novocaledonicum*); Krombein, 1949a:361 (diagnostic characters; New Hebrides, now Vanuatu, and Hawaii); Weber, 1949:332 (Hawaiian Islands: Oahu); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands); Yoshimoto, 1960:334 (Hawaiian Islands); Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Menke, 1979a:303 (Tahiti); Villemant, 2011:133 (Vanuatu: island of Espiritu Santo: Luganville and Panaoru).

As *Pison* sp.: Weber, 1948:222 (Hawaii: Oahu), corrected to *Pison insulare* by Krombein, 1949a:361.

**LECTOTYPE DESIGNATION.**— Smith described *Pison insulare* without indicating the number of specimens examined. I have designated as the lectotype of this species the only specimen from New Hebrides (now Vanuatu) in the Natural History Museum, London, carrying his determination label.

**RECOGNITION.**— Like most of the Pacific Islands *Pison*, *P. insulare* has a microareolate, dull frons, with well-defined, sparse punctures (Fig. 1304), and the hindocellus close to the eye orbit (ocellocular distance  $0.2\text{--}0.5 \times$  hindocellar diameter). The setae of the lower gena are erect, sinuous, about as long as  $1.5 \times$  midocellar diameter. Unlike other such species (*P. glabrum*, *P. nigelum*, *P. novocaledonicum*, *P. reichingeri*, and *P. trukense*), *P. insulare* has erect scutal setae whose length is  $0.7\text{--}1.0 \times$  midocellar diameter in the female and  $0.4\text{--}0.8 \times$  in the male, the mandible in many specimens with a fine abductor ridge, and tergum I in most specimens with erect setae on declivous basal area (Fig. 1308). Subsidiary recognition features are: mesopleural punctures near center averaging 2-3 to several diameters apart in the vast majority of specimens (about one diameter apart in a male from Erromango Island, Vanuatu), apex of marginal cell markedly closer to wing apex than that of submarginal cell III, propodeum without longitudinal carina separating side from dorsum and posterior surface, most of propodeal dorsum minutely punctate (punctures averaging several diameters apart), apical depressions of terga microscopically punctate and at least those of terga I and II covered with silvery, setal fasciae. Unlike *P. marginatum* and *P. ponape*, sternum II of *P. insulare* is impunctate mesally, rather than densely punctate.

**DESCRIPTION.**— Frons microareolate, dull, with well-defined punctures that average several

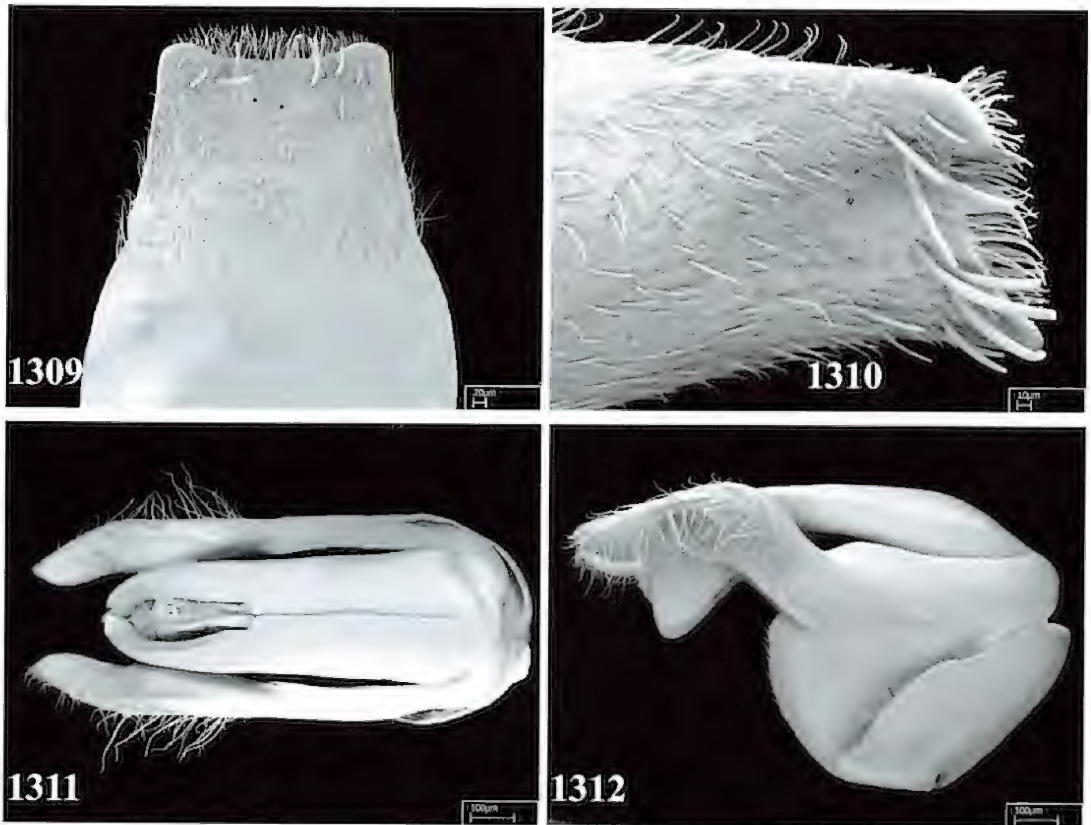


FIGURES 1304-1308. *Pison insulare* F. Smith. (1304) Female clypeus and mandibles; (1305) Male clypeus and mandibles; (1306) Upper frons of female; (1307) Propodeal dorsum of female; (1308) Tergum 1 of female in lateral oblique view showing erect setae.

diameters apart (Fig. 1306). Gena narrow in dorsal view. Labrum shallowly emarginate mesally. Mandible in many specimens with abductor ridge. Anteromedian pronotal pit transversely elongate, about 1.5 × as long as midocellar diameter. Propleuron impunctate anterolaterally in female and some males. Scutum not foveate along flange, without short

longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging several diameters apart; interspaces finely microsculptured, shiny. Tegula enlarged, angular apically. Mesopleural punctures slightly larger than those on scutum, near center averaging 2-3 to several diameters apart in vast majority of specimens (about one diameter apart in male from Erromango Island, Vanuatu); interspaces unsculptured, shiny. Postspiracular carina present, about twice as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum without transverse ridges emerging from midline, most of surface as well as side minutely punctate, punctures averaging several diam-





FIGURES 1309-1312. *Pison insulare* F. Smith, male. (1309) Sternum VIII (ventral surface); (1310) Sternum VIII in lateral oblique view; (1311) Genitalia in dorsal view; (1312) Genitalia in lateral view.

eters apart (lateral punctures 2-3 diameters apart in several specimens), interspaces unsculptured, shiny (Fig. 1307); posterior surface punctate, ridged ventrally. Posteroventral forefemoral surface with well-defined punctures that average a few diameters apart. Hindcoxal dorsum with outer margin sharply carinate in posterior third or so. Punctures of tergum I minute, several diameters apart. Sternum II impunctate mesally, sternum III with a few, microscopic punctures mesally.

Setae erect or suberect on frons, radiating from frons center in male, silvery in ventral half, dark below midocellus; on scutum dark, erect or suberect, as long as  $0.7-1.0 \times$  midocellar diameter in female (but about  $0.5$  midocellar diameter in a female from Lakotorom, Vanuatu) and  $0.4-0.8$  in male; on lower gena erect, sinuous, about as long as  $1.5 \times$  midocellar diameter; erect or inclined posterad on scutum, about as long as midocellar diameter; not concealing integument on clypeus in female, partly concealing in male; on tergum I erect and elongate on anterior declivity (Fig. 1308) in most specimens (setal length  $0.3-1.0$  midocellar diameter), but appressed in many females from Vanuatu. Apical depressions of terga I and II to I-IV with silvery, setal fasciae (of terga I and II only in females from Hawaii).

Body all black, mandible ferruginous preapically.

♀.— Upper interocular distance equal to  $0.48-0.52 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5-0.6 \times$  hindocellar diameter; eye height equal to  $0.98-1.10 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate (Fig. 1304). Dorsal length of flagellomere I  $3.1 \times$  apical width,

of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Length 8.8-11.0 mm; head width 2.5-3.0 mm.

♂.—Upper interocular distance equal to  $0.62-0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.2-0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6-0.7 \times$  hindocellar diameter; eye height equal to  $1.04-1.06 \times$  distance between eye notches. Free margin of clypeal lamella acutely angulate to obtusely angulate (Fig. 1305). Dorsal length of flagellomere I  $2.7 \times$  apical width, of flagellomere X  $1.4 \times$  apical width. Sternum VIII emarginate apically (Fig. 1309); in lateral oblique view: Fig. 1310. Genitalia: Figs. 1311, 1312. Length 6.9-10.7 mm; head width 2.0-2.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1313).—Cook Islands, French Polynesia, Hawaiian Islands, Vanuatu.

**RECORDS.—COOK ISLANDS:** Aitutaki Atoll: Amuri (1 ♂, BISH). **Rarotonga Island:** Avana (1 ♂, BISH), Avana Valley (1 ♂, BISH), Avarua (1 ♀, AMNH; 8 ♀, 2 ♂, BISH), Avatiu Valley (2 ♀, 2 ♂, BISH), Titikaveka (3 ♂, AMNH; 5 ♀, 8 ♂, BISH), no specific locality (1 ♀, BMNH).

**FRENCH POLYNESIA:** **Austral Islands:** Rurutu Island: Moera (2 ♀, BISH), Tubuai Island: Mahu (4 ♀, 3 ♂, AMNH; 1 ♀, 15 ♂, BISH; 1 ♀, 1 ♂, BMNH). **Marquesas Islands:** Hiva Oa Island: Hanaiapa Valley (3 ♀, BISH), Nuku Hiva Island: 2 km NW Taiohae (1 ♀, BISH), Taiohae to Uauka Valley (1 ♀, BISH), Taipivai to Toovii (1 ♂, BISH), Toovii to Taiohae (1 ♂, BISH). **Moorea:** Afareaitu (1 ♂, BMNH). **Society Islands:** Bora Bora Island: Vaitape (3 ♂, BISH), Huahine Island: Fare (1 ♀, BISH), Haavai (1 ♀, BISH), Raiatea Island: Uturoa (1 ♀, BISH). **Tahiti:** Mahina (1 ♂, BMNH), Papenoo [River] (1 ♀, BMNH).

**HAWAIIAN ISLANDS:** **Hawaii:** Akaka Falls State Park (1 ♀, BISH), Hilo (8 ♀, UCD), E Honokane Iki in Kohala District (1 ♀, UCD), Keauhou (1 ♀, BISH), mouth of Pololu Valley (1 ♀, BISH). **Kauai:** northern side of Haupu (1 ♀, BISH). **Lanai:** Maunalei (1 ♀, BISH). **Maui:** Puaaluu Gulch (2 ♀, BISH). **Oahu:** Aiea Heights (21 ♀, BISH), Aiea State Park above Pearl Harbor (8 ♀, CAS), Anahulu trail (Krombein, 1949a), Ewa Coral Plain (1 ♂, BISH), Hahaione Valley (1 ♀, BISH), north Halawa Valley (2 ♀, BISH), Helemano (1 ♀, BISH), Honolulu (19 ♂, UCD), Honolulu: Foster Botanical Garden (1 ♀, BISH), Honolulu: Makiki Street (1 ♀, BISH), Honolulu: Moana (1 ♀, BISH), Honolulu: Nuuanu Valley (16 ♀, 8 ♂, CAS), Honolulu: Palolo (1 ♀, BISH), Kawaiiki trail (Krombein, 1949a, Weber, 1949), Koolau Mountains: Poamoho Stream area (3 ♀, 1 ♂, CAS), Lualualei Naval Magazine: Halona Valley at  $21^{\circ}25'N$   $158^{\circ}06'W$  (33 ♀, CAS), Manoa Falls trail (1 ♀, BISH), Mauna Lua Valley (2 ♀, BISH), Moanalua Valley (1 ♀, BISH), Mount Tantalus (3 ♀, 2 ♂, BISH; 2 ♀, CAS), Poamoho Trail (5 ♀, BISH), Puu Hapapa (1 ♀, BISH), Sacred Falls trail (1 ♀, BISH), Waianea Mountains (2 ♀, 1 ♂, CAS), Waimanalo (1 ♀, 1 ♂, BISH), Waimea Falls Park (2 ♀, 1 ♂, BISH), no specific locality (1 ♀, BISH).

**VANUATU:** **Ambrym Island:** Ranon to Mount Toyo (1 ♀, BISH), no specific locality (5 ♀, BISH). **Aneityum Island:** Anelgaohat (1 ♂, BISH). **Aoba (= Ambate) Island:** Lolowai (2 ♀, BISH). **Banks Islands:** Gaua (Cheesman, 1937). **Efate Island:** Port Vila (4 ♀, 1 ♂, BISH), Port Vila [as Vatr: Pro de Vila] (1 ♀, BMNH), 10 km SE Port Vila (2 ♀, BISH), 40 km NE Port Vila (2 ♀, BISH). **Epi Island:** Lowekewou (3 ♀, BISH), Vaemali (4 ♀, 1 ♂, BISH), Vlave (2 ♀, BISH). **Erromango Island:** Dillon Bay (1 ♀, 1 ♂, BISH), 11 km W Ipota (1 ♂, BISH). **Espiritu Santo Island:** Luganville (1 ♀, BISH), Luganville and Panaoru (Villemant, 2011), limestone plateau N Maat (3 ♀, BISH), Narango (1 ♀, BISH), Tasmalum (2 ♀, BISH), and no specific locality (2 ♀, CAS). **Maewo Island:** Malolo (1 ♂, BISH). **Malekula Island:** Lamap (1 ♀, BISH), Lokatoro (21 ♀, BISH), no specific locality (1 ♂, BMNH). **Pentecost Island:** no specific locality (1 ♀, BISH). **Tanna Island:** Lenakel (1 ♀, AMNH; 20 ♀, 2 ♂, BISH), no specific locality (1 ♀, BISH).

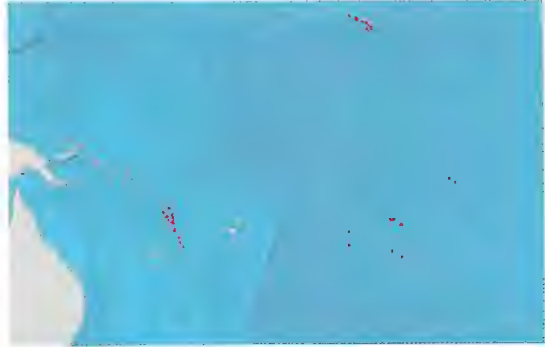


FIGURE 1313. Collecting localities of *Pison insulare* F. Smith.



*Pison mariannense* Yasumatsu

Figures 1314-1319.

*Pison mariannense* Yasumatsu, 1953:141, ♀, ♂. Holotype: ♂, Mariana Islands: Island of Rota: Tetêcho-Tatâcho-Soñgsoñg (ELKU), examined. — Yasumatsu, 1953: 134 (in list of *Pison* of Pacific islands); Tsuneki, 1968b:22 (Marianas, as *marianense*); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae).

**RECOGNITION.**— *Pison mariannense* is unique among its Pacific Islands congeners in having an unusual wing venation: the apex of the marginal cell and that of the third submarginal cell are almost equidistant from the wing apex (Fig. 1318) rather than the apex of the marginal cell being markedly closer to the wing apex than that of the third submarginal cell. Subsidiary recognition features are: setae of lower gena slightly sinuous, up to about  $1.5 \times$  as long as midocellar diameter, appressed on tergum I; propodeum without carina separating side from dorsum and posterior surface.

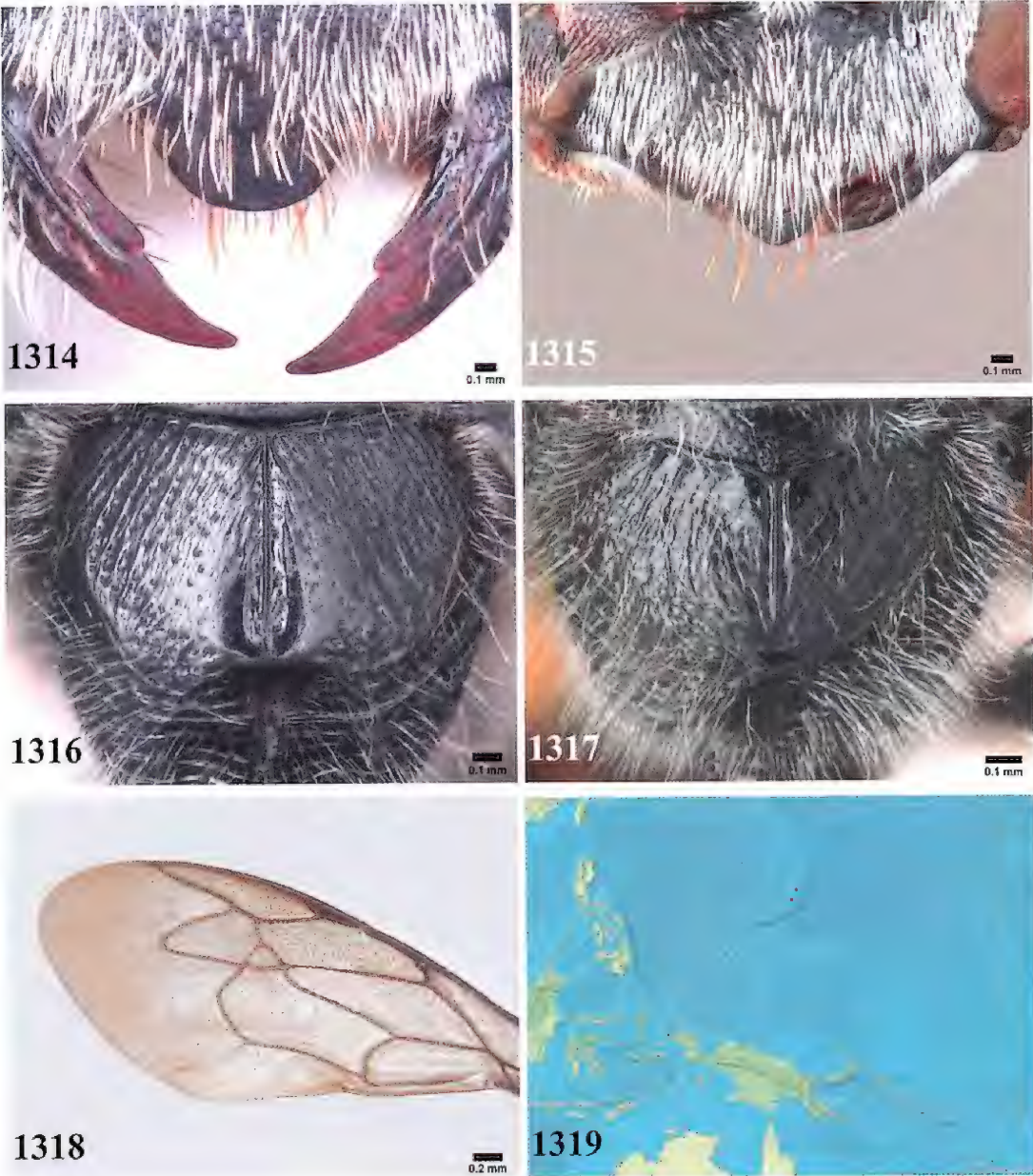
**DESCRIPTION.**— Frons dull, conspicuously microsculptured, minutely punctate, punctures several diameters apart. Occipital carina joining hypostomal carina. Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, many diameters apart at center, in male about one diameter apart anterolaterally and posterolaterally; interspaces aciculate. Tegula not enlarged. Mesopleural punctures well defined, 1-2 diameters apart at center; interspaces aciculate. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum obliquely ridged (in female ridges reduced mesally), punctate between ridges (Figs. 1316, 1317); side ridged, ridges fine anteriorly, coarser posteriorly (invisible from certain angles), integument punctate between ridges; posterior surface conspicuously, transversely ridged, punctate between ridges, ridges extending onto lateral surface. Wing venation unusual: apex of marginal cell and that of third submarginal cell almost equidistant from wing apex (Fig. 1318). Posteroventral forefemoral surface impunctate in female, in male with well-defined punctures that average one diameter apart. Punctures of tergum I minute, several diameters apart anterior to apical depression. Sternum II with minute punctures that are several to many diameters apart (except close to each other near lateral margin in male).

Setae silvery, erect on upper frons (and about  $1.5 \times$  as long as midocellar diameter in female, slightly longer than midocellar diameter in male), appressed on most of postocellar area, erect on scutum (here about as long as midocellar diameter), appressed on tergum I; on lower gena slightly sinuous, up to about  $2.0 \times$  midocellar diameters in female, about  $1.5$  in male; not concealing integument on clypeus. Apical depressions of terga without silvery, setal fasciae in female, with ill-defined silvery, setal fasciae in male.

Body all black

♀.— Upper interocular distance equal to  $0.62 \times$  lower interocular distance; ocellocular distance equal to  $0.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $0.94 \times$  distance between eye notches. Free margin of clypeal lamella roundly subtruncate (Fig. 1314). Dorsal length of flagellomere I  $2.2 \times$  apical width, of flagellomere IX  $1.3 \times$  apical width. Mandible: trimmal carina with small incision at about two thirds of length. Length 8.7 mm; head width 2.4 mm.

♂.— Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.9 \times$  hindocellar diameter, distance between hindocelli equal to  $0.9 \times$  hindocellar diameter; eye height equal to  $1.00 \times$  distance between eye notches. Free margin of clypeal lamella obtuse-



FIGURES 1314-1318. *Pison mariannense* Yasumatsu (female, male holotype). (1314) Female clypeus and mandibles; (1315) Male clypeus (1316) Propodeal dorsum of female; (1317) Propodeal dorsum of male; (1318) Left forewing of holotype.

FIGURE 1319. Collecting localities of *Pison mariannense* Yasumatsu.



ly angulate (Fig. 1315). Dorsal length of flagellomere I  $1.8 \times$  apical width, of flagellomere X  $1.1 \times$  apical width. Sternum VIII with apical margin rounded. Length 7.0 mm; head width 2.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1319).—Known only from the islands of Rota and Saipan in the Mariana archipelago.

**RECORDS.**—**MARIANA ISLANDS:** Rota Island: Tetêto-Tatâcho-Soñgsoñg (1 ♂, ELKU, holotype of *Pison mariannense*). Saipan: Fanagam (1 ♀, ELKU, allotype of *Pison mariannense*).

### *Pison nigellum* Krombein

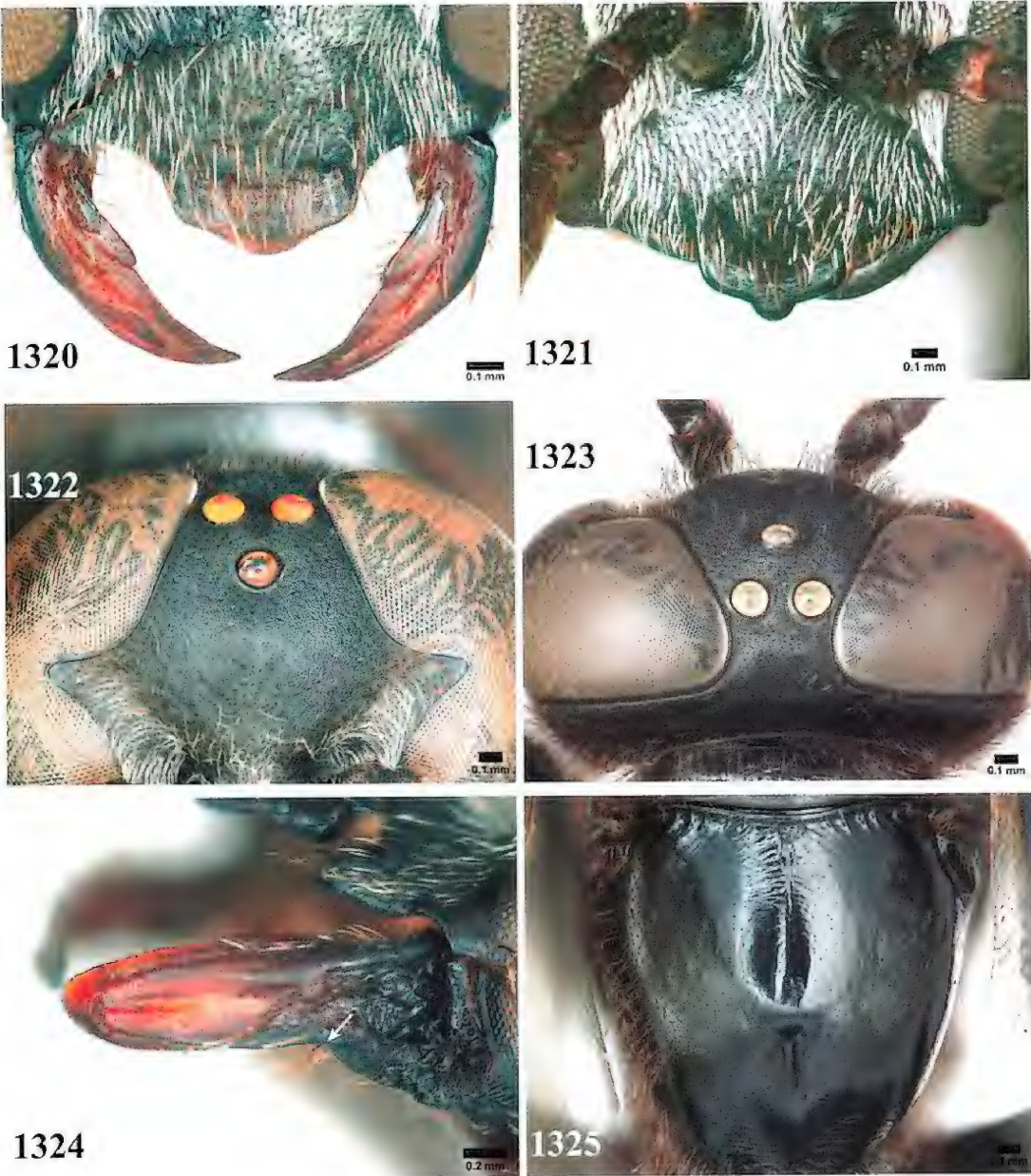
Figures 1320-1329.

*Pison nigellum* Krombein, 1949b:401, ♀, ♂. Holotype: ♀, Caroline Islands: Pohnpei Island (formerly Ponape); Kolonia (USNM), paratypes examined. — Krombein, 1949b:384 (in key to Sphecidae of Micronesia), 1950b:139 (nesting in cliffs); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 144 (bibliographic references; Caroline Islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Gess, 1981:70 (nesting in pre-existing cavities reported).

**RECOGNITION.**—*Pison esakii* and *P. nigellum* are the only Pacific Islands species with black setae on the upper frons, thorax, and propodeum. Subsidiary recognition features are: punctures several diameters apart on frons, several diameters apart on scutal disk and propodeal dorsum, setae of lower gena sinuous, up to about  $1.5 \times$  midocellar diameter long and appressed on tergum I, ocellocular distance about  $0.3 \times$  hindocellar diameter, and gastral terga without silvery, apical fasciae. Unlike *P. esakii*, the propodeum of *P. nigellum* lacks the longitudinal carina separating the dorsum from the side (carina present in *P. esakii*), the median sulcus and carina on the dorsum are inconspicuous (well defined in *P. esakii*), and the propodeal posterior surface is unridged in dorsal half (conspicuously ridged throughout in *P. esakii*). The two species have different geographic distributions: *P. esakii* is known from Guam and the adjacent island of Rota, whereas *P. nigellum* occurs on the island of Pohnpei.

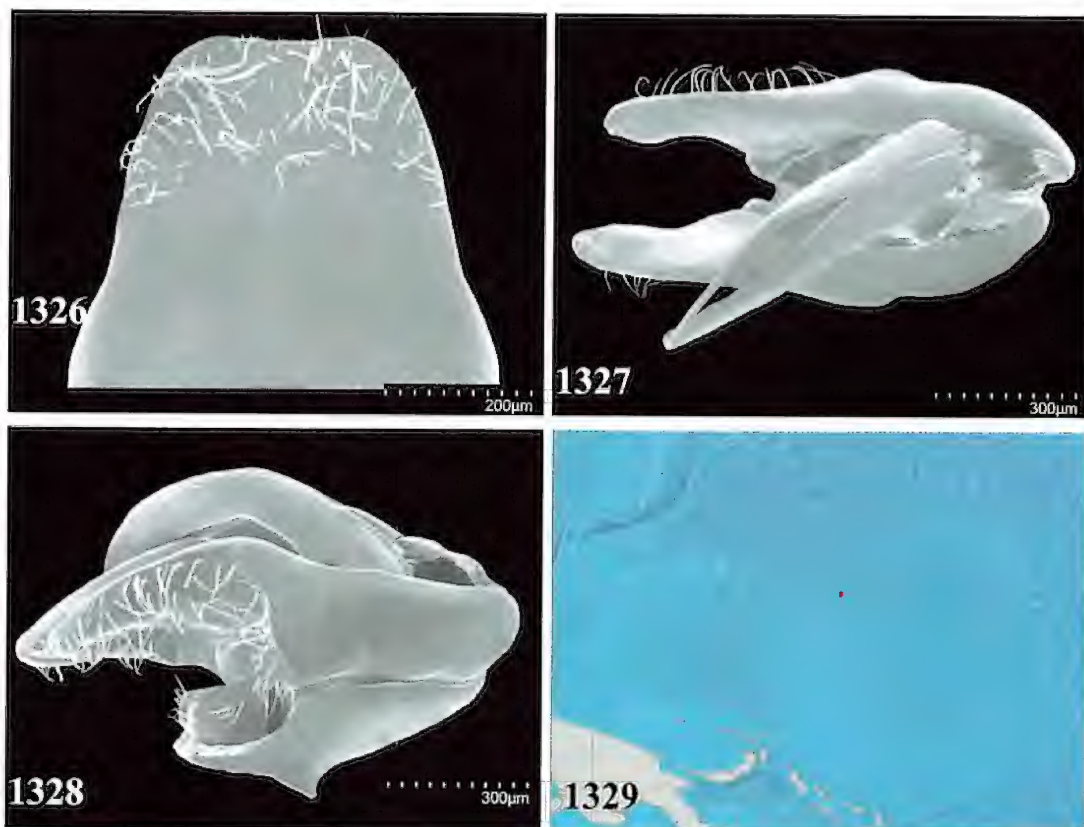
**DESCRIPTION.**—Frons dull, finely punctate, punctures several diameters apart (Fig. 1322). Occipital carina slightly expanded ventrally (carina width about  $0.2 \times$  midocellar diameter). Posterior mandibular margin slightly emarginate (Fig. 1324). Gena narrow in dorsal view (Fig. 1323). Labrum emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Propleuron sparsely punctate anteriorly. Scutum either foveate or not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures fine, several diameters apart (about 1-2 diameters apart next to foremargin); interspaces aciculate. Tegula not enlarged. Mesopleural punctures several diameters apart; interspaces aciculate. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter; integument depressed between postspiracular carina and episternal sulcus. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum without longitudinal carina separating side from dorsum and posterior surface; dorsum and side unridged, minutely punctate, punctures several diameters apart; dorsum in female with inconspicuous middle carina in shallow sulcus (Fig. 1325), carina in some specimens extending only to dorsum midlength, without sulcus in male; posterior surface microscopically punctate (punctures several diameters apart), unridged in dorsal half, in ventral half with shallow concavity on each side of median sulcus (concavity ridged, but ridges visible only from certain angles). Posteroventral forefemoral surface finely punctate, punctures 2-4 diameters apart. Hindcoxal dorsum with outer margin sharply carinate. Horizontal part of tergum I, tergum II, and sternum II with microscopic punctures that are many diameters apart, interspaces mesally unsculptured, shiny.

Setae black on the head, thorax, and propodeum except silvery on lower frons laterally and on clypeus laterally, erect on upper frons and scutum (here varying in length from about  $0.5 \times$  to about



FIGURES 1320-1325. *Pison nigellum* Krombein. (1320) Female clypeus and mandibles; (1321) Male clypeus; (1322) Upper frons of female; (1323) Female head in dorsal view; (1324) Female mandible (outer surface, arrow shows emargination); (1325) Propodeal dorsum of female.





FIGURES 1326-1328. *Pison nigellum* Krombein, male. (1326) Sternum VIII (ventral surface); (1327) Genitalia in dorsal view; (1328) Genitalia in lateral view.

FIGURE 1329. Collecting localities of *Pison nigellum* Krombein.

0.8 × midocellar diameter), not concealing integument on clypeus; setae of lower gena sinuous, up to about 1.5 × midocellar diameter in length; terga I and II glabrous mesally. Terga without setal, silvery fasciae.

Body all black.

♀.— Upper interocular distance equal to 0.48-0.52 × lower interocular distance; ocellocular distance equal to 0.2 × hindocellar diameter, distance between hindocelli equal to 0.5-0.6 × hindocellar diameter; eye height equal to 1.06 × distance between eye notches. Free margin of clypeal lamella roundly arcuate to slightly sinuous (Fig. 1320). Dorsal length of flagellomere I 2.5-2.6 × apical width, of flagellomere IX 2.1-2.2 × apical width. Mandible: trimmal carina with small incision at about midlength. Length 7.5-8.0 mm; head width 2.1-2.3 mm.

♂.— Upper interocular distance equal to 0.66 × lower interocular distance; ocellocular distance equal to 0.3 × hindocellar diameter, distance between hindocelli equal to 0.6 × hindocellar diameter; eye height equal to 1.10 × distance between eye notches. Free margin of clypeal lamella arcuate, with rounded midpoint (Fig. 1321). Dorsal length of flagellomere I 2.4 × apical width, of flagellomere X 1.2 × apical width. Mandible with abductor ridge. Sternum VIII truncate apically (minimally concave), without apicolateral corner (Fig. 1326). Genitalia: Figs. 1327, 1328. Length 6.8 mm; head width 1.9 mm.

**NESTING HABITS.**— Krombein (1950) reported that the species was nesting in a clay bank, probably using abandoned burrows of other insects.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1329).—Known only from island of Pohnpei (formerly Ponape) in the Caroline Archipelago.

**RECORDS** (all specimens examined except those from Mount Tamatamansakir and except the allotype male are paratypes of *Pison nigellum*).—**FEDERATED STATES OF MICRONESIA**: Pohnpei Island: Kolonia (1 ♀, BISH; 1 ♀, USNM), Mount Tamatamansakir (4 ♀, BISH), Roi (1 ♀, BISH; 2 ♀, USNM), Reitao (1 ♀, BISH), Ronkiti (2 ♀, BISH; 1 ♀, CAS; 2 ♀, USNM), Tamon-Reitao (1 ♀, BISH; 1 ♀, USNM), Wonel (1 ♀, BISH), no specific locality (3 ♀, 1 ♂, BISH; 1 ♀, CAS; 3 ♀, USNM).

***Pison novocaledonicum* Krombein**

Figures 1330-1337.

As *Pison insulare*: F. Williams, 1945:442 (New Caledonia), corrected to *Pison novocaledonicum* by Krombein, 1949a:362.

As *Pison tahitense*: Krombein, 1949b:385 (in key to Sphecidae of Micronesia), **present correction**.

*Pison novocaledonicum* Krombein, 1949a:362, ♀, ♂ (as *novocaledonica*, incorrect original termination).

Holotype: ♀, New Caledonia: St. Louis (USNM), paratypes examined. — Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Callan, 1990:20 (New Caledonia: no specific locality); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia).

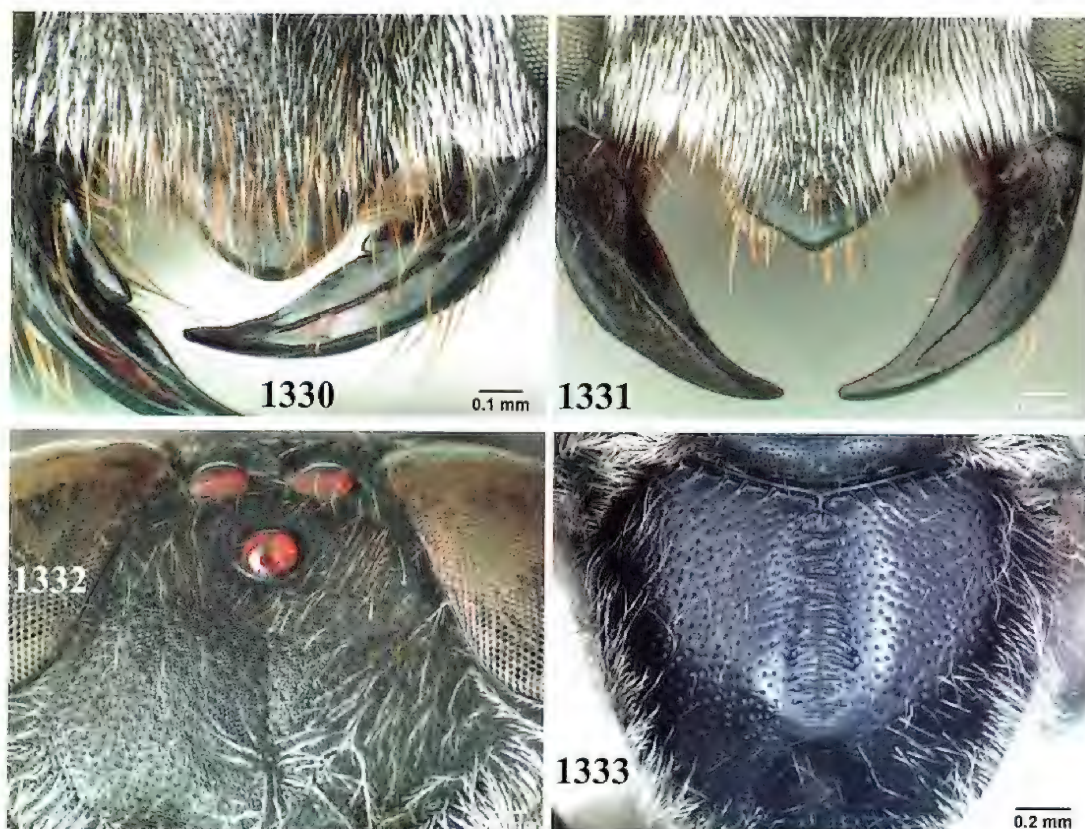
*Pison susanae* Cheesman, 1955:83, ♀, ♂. Holotype: ♀, New Caledonia: Puébo: Mont Tinchialit (BMNH), examined. **New synonym**. — R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Callan, 1990:20 (New Caledonia: no specific locality); Jennings, Krogmann, and Burwell, 2013:32 (in checklist of Hymenoptera of New Caledonia).

**RECOGNITION**.—*Pison novocaledonicum*, an endemic of New Caledonia, closely resembles *P. reichingeri* (see that species for recognition features), but differs in having the punctures of the propodeal dorsum more than one diameter apart, and the apical margin of male sternum VIII truncate or nearly so; also, the wings are markedly infumate. In *P. reichingeri*, either all punctures of the propodeal dorsum are less than one diameter apart or only those adjacent to the midline are more than one diameter apart, and the apical margin of male sternum VIII is shallowly, broadly emarginate; in most specimens the wings are slightly infumate.

**JUSTIFICATION OF NEW SYNONYMY**.—I compared the holotype of *Pison susanae* with a pair of paratypes of *Pison novocaledonicum*. These specimens are clearly conspecific, and the two names are therefore synonyms.

**DESCRIPTION**.—Frons dull, microscopically areolate, with well-defined punctures averaging 2-3 diameters apart in females (Fig. 1332), finer and averaging 1-2 diameters apart in males. Gena in female narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit minimally transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, most of them more than one diameter apart. Tegula minimally enlarged. Mesopleural punctures well defined, averaging about two diameters apart near center in female, about one diameter apart in male; interspaces unsculptured. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle (carina evanescent in some specimens); dorsum with shallow median sulcus crossed by small transverse or oblique ridges, in most specimens with median carina limited to basal quarter or half of dorsum; dorsum surface punctate, punctures more than one diameter apart (Fig. 1333); side punctate, punctures 1-2 diameters apart except less than one diameter apart posteroventrally; posterior surface punctate, transversely ridged in ventral half. Posteroventral





FIGURES 1330-1333. *Pison novocaledonicum* Krombein. (1330) Female clypeus and mandibles; (1331) Male clypeus and mandibles; (1332). Upper frons of female; (1333) Propodeal dorsum of female.

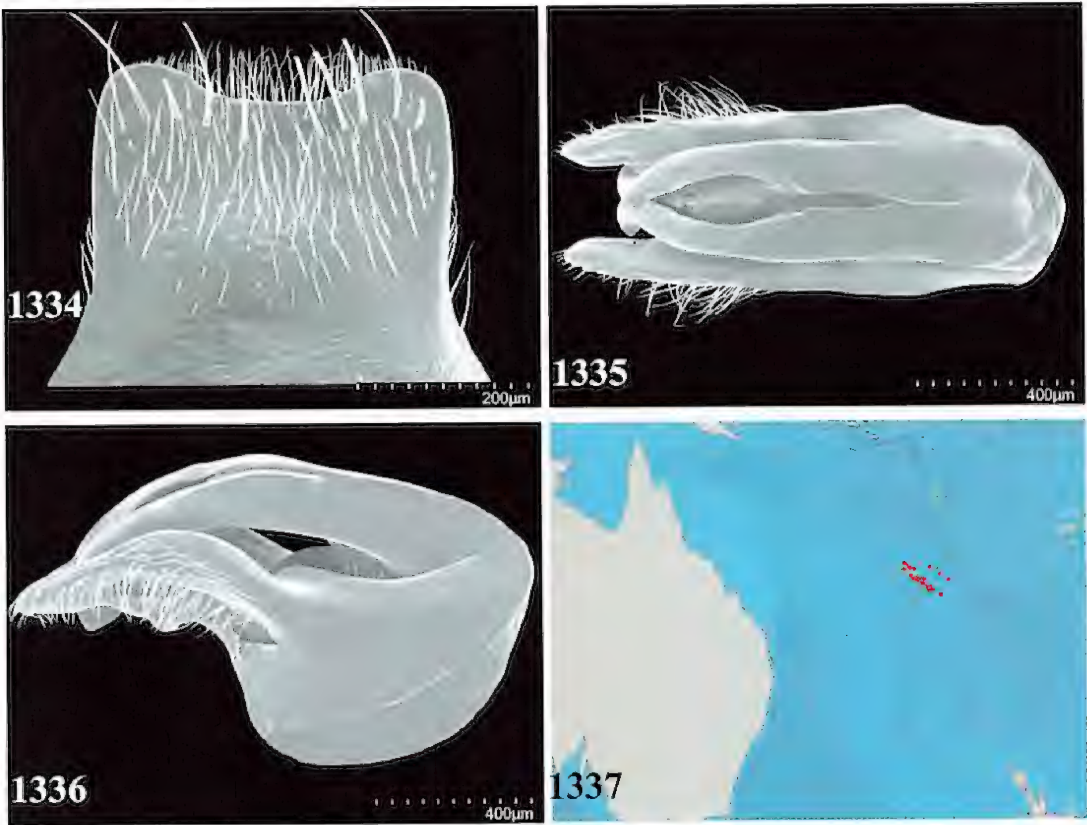
forefemoral surface with fine punctures that average a few diameters apart. Hindcoxal dorsum with outer margin carinate in apical half. Punctures of tergum I averaging about 2-3 diameters apart on disk of horizontal part. Punctures of sternum II microscopic, many diameters apart mesally, somewhat larger and markedly denser near lateral margin.

Setae silvery, suberect to erect on frons, up to one midocellar diameter long; erect on scutum, about as long as  $0.5 \times$  midocellar diameter; appressed on tergum I; on lower gena erect, sinuous, up to two midocellar diameters long; not concealing integument on clypeus in female, nearly completely concealing in male. Apical depressions of terga I-III with silvery, setal fasciae.

Body all black. Wings conspicuously infumate.

♀.— Upper interocular distance equal to  $0.54-0.56 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter; eye height equal to  $1.02-1.06 \times$  distance between eye notches. Free margin of clypeal lamella arcuate to subrectangular (Fig. 1330). Dorsal length of flagellomere I  $2.8-2.9 \times$  apical width, of flagellomere IX  $1.7-1.8 \times$  apical width. Mandible: trimmal carina with small incision shortly beyond midlength. Tergum VI with median carina preapically. Length 9.5-11.8 mm; head width 2.6-3.1 mm.

♂.— Upper interocular distance equal to  $0.64-0.66 \times$  lower interocular distance; ocellocular distance equal to  $0.3-0.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5-0.6 \times$  hindocellar diameter; eye height equal to  $1.08 \times$  distance between eye notches. Free margin of



FIGURES 1334-1336. *Pison novocaledonicum* Krombein, male. (1334) Sternum VIII (ventral surface); (1335) Genitalia in dorsal view; (1336) Genitalia in lateral view.

FIGURE 1337. Collecting localities of *Pison novocaledonicum* Krombein

clypeal lamella obtusely angulate (Fig. 1331). Dorsal length of flagellomere I  $2.5\text{--}2.6 \times$  apical width, of flagellomere X  $1.5\text{--}1.7 \times$  apical width. Sternum VIII truncate apically to minimally emarginate (Fig. 1334). Genitalia: Figs. 1335, 1336. Length 8.7-10.1 mm; head width 2.4-2.5 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1337).— New Caledonia.

**RECORDS.**— **NEW CALEDONIA** (Krombein, 1949a or as indicated): **Grande Terre:** Anse Vata (1 ♀, 1 ♂, BISH), Bonjour District, Bouirou village 20 km N Bourail (3 ♀, BMNH), Bourail, 22 km E Bourail (1 ♂, UCD), Col d'Amieu (2 ♀, BISH; 1 ♀, BMNH), Col de Pirogue (2 ♀, BISH), Col des Roussettes (2 ♀, 1 ♂, BISH), Couli near La Foa (1 ♂, BISH), Forêt de la Thy (4 ♀, 1 ♂, BISH; 1 ♀, BMNH), Hienghene (2 ♀, BISH), La Crouen (1 ♀, BISH), 17 km SW La Crouen (1 ♂, BISH), Mokoue to Dothio (2 ♀, BISH), Mont Do: Boulouparis (2 ♀, CAS; 7 ♀, 3 ♂, IANC), Mont Koghis (7 ♀, 5 ♂, BISH; 2 ♀, 5 ♂, BMNH; 2 ♀, 1 ♂, UCD), Mont Mou west side (1 ♂, UCD), Mont Tinchalit (Cheesman, 1955), Nakety, Nepoui Valley, Nassiran (1 ♂, BISH), Nouméa (4 ♀, 2 ♂, BISH; 5 ♀, 3 ♂, BMNH), hills behind Nouméa (1 ♂, CAS, paratype of *Pison novocaledonicum*), Oua Tom, 2 km E Ouégoa (1 ♀, UCD), mountains above Ouaco (1 ♂, BISH), Parc Provincial de la Rivière Bleue at  $22^{\circ}05'52''\text{S } 166^{\circ}38'17''\text{E}$  (1 ♀, MNKB), Plateau de Dogny (2 ♀, 1 ♂, BISH), 6 km N Plum (1 ♀, UCD), Prony Bay, Puébo (1 ♀, BMNH, holotype of *Pison susanae*), Poya: Beupré (1 ♂, CAS; 1 ♀, IANC), Rivière-Bleue (2 ♀, UCD), Saint Louis, Saint Louis Valley (1 ♀, BISH), Sarraméa (1 ♂, UCD), Sarraméa: col d'Amieu (1 ♀, CAS; 5 ♀, IANC), Tao (1 ♂, BISH), Thi River (1 ♀, CAS, paratype of *Pison novocaledonicum*), Touho (1 ♂, UCD), Yahoue (1 ♀, 1 ♂, BISH). **Île des Pins:** near Kuto (1 ♀, 1 ♂, BMNH), Vao (1 ♂, CAS). **Loyalty Islands:** Cape des Pins on Lifou Island (Cheesman, 1955), Lifou Island (3 ♀, BISH), Maré Island: Penelo (1 ♀, BMNH), Ouvéa Island: Fayaoue (2 ♀, 1 ♂, BISH).



***Pison oakleyi* Krombein**

Figures 1338-1344.

As *Pison* sp.: Fullaway, 1913:283 (Guam) and Swezey, 1942:185 (Guam), corrected to *Pison oakleyi* by Krombein, 1949b:406.

*Pison oakleyi* Krombein, 1949b:406, ♂, ♀. Holotype: ♂, Guam: Point Ritidian (USNM), paratypes examined. – Krombein, 1949b:385 (in key to Sphecidae of Micronesia), 1950b:134 and 139 (illustrations of head, sternum III, and genitalia); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 144 (bibliographic references; Mariana Islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Terayama and Nambu, 2009:2, 23 (in key to Trypoxylini of Japan).

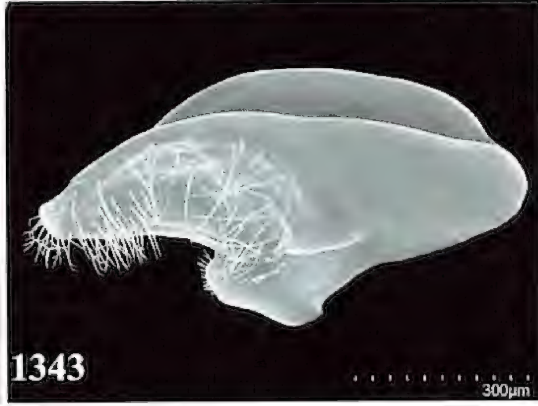
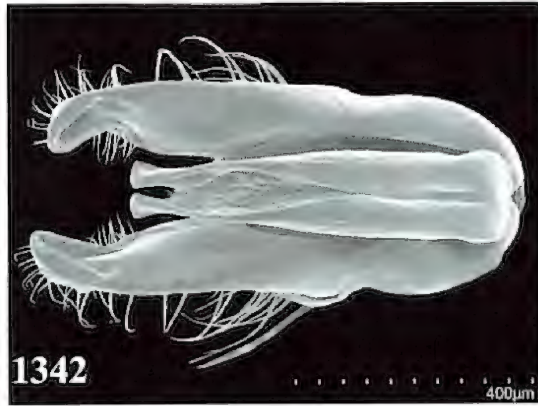
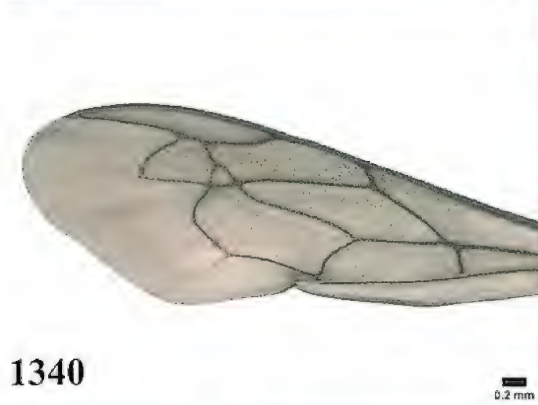
*Pison oakleyi rotaense* Tsuneki, 1968b:22, ♀, ♂. Holotype: ♂, Mariana Islands: Rota Island (Bishop Mus.). – R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae).

*Pison oakleyi boninense* Tsuneki, 1973:19, ♀. Holotype: Japan: Bonin Islands: Island of Chichidzima (K. Haneda coll.). – Haneda, 1973:30 (Japan: Bonin Islands: Chichijimas Islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Tsuneki, 1984a:11 (known from Ogasawara = Bonin Islands); Takahashi, 2010:19 (Japan: in list of Hymenoptera of Ogasawara = Bonin islands).

**RECOGNITION.**– *Pison oakleyi* resembles *P. westwoodii* in most characters. Like that species, it has a black body, three submarginal cells, the second recurrent vein contiguous with the second intersubmarginal vein or nearly so, the setae shorter than midocellar width on the lower gena and appressed on tergum I, punctures more than one diameter apart on the mesopleuron, and a narrow ocellocular distance (equal to  $0.2 \times$  midocellar diameter in the female and to  $0.3 \times$  in the male), the apex of the marginal cell markedly closer to the wing apex than that of submarginal cell III, and tergum I not microareolate between the punctures. It differs from *P. westwoodii* in having the mesopleuron and the propodeal side unsculptured between the punctures and the wing membrane conspicuously infumate (Fig. 1340), the specimens from Guam also in having the terga without silvery, apical fasciae or only tergum I with such a fascia, and those from Rota Island (*P. oakleyi rotaense*) in having the punctures of the frons microscopically small, practically indistinguishable from the remaining microsculpture. In *P. westwoodii*, the mesopleuron and the propodeal side are microsculptured between the punctures in most specimens (but unsculptured in some specimens from Koror Island and some from Pohnpei Island), the wing membrane is slightly infumate, the terga are silvery fasciate apically, and the punctures of the frons are minute but well defined.

**DESCRIPTION.**– Frons dull, minutely punctate, punctures more than one diameter apart. Distance between antennal socket and orbit slightly smaller than socket diameter. Gena narrow in dorsal view. Labrum shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $1.5 \times$  midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures minute, 1-2 diameters apart; interspaces aciculate. Scutellum sulcate along anterior margin. Tegula not enlarged. Mesopleural punctures fine but well defined, about 1-2 diameters apart at center; interspaces unsculptured. Postspiracular carina present, about as long as midocellar diameter. Metapleural sulcus not costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum either predominantly ridged (unridged only apicomeresally), punctate between ridges, or predominantly unridged, minutely punctate (punctures 2-3 diameters apart), interspaces unsculptured; side minutely punctate, not ridged, interspaces unsculptured; posterior surface transversely ridged, punctate between ridges. Hindcoxal dorsum with outer margin sharply carinate at apex. Punctures of tergum I microscopically small, several diameters apart anterior to apical depression. Sterna punctate throughout, punctures several diameters apart at center of sternum II.

Setae silvery, appressed on upper frons, postocellar area, scutum, and tergum I; not conceal-



FIGURES 1338-1343. *Pison oakleyi* Krombein. (1338) Female clypeus and mandibles; (1339) Male clypeus and mandible; (1340) Left forewing of female; male; (1341) Sternum VIII (ventral surface); (1342) Genitalia in dorsal view; (1343) Genitalia in lateral view.



ing integument on clypeus; on lower gena straight (curved apically), suberect, markedly shorter than midocellar diameter. Terga without apical, setal fasciae or tergum I with ill-defined such fascia in population from Guam, but terga I and II in female, and I-IV in male silvery fasciate in this from Rota Island.

Body all black, mandible brown apically. Wing membrane markedly infumate (Fig. 1340).

♀.— Upper interocular distance equal to  $0.50-0.54 \times$  lower interocular distance; ocellocular distance equal to  $0.2 \times$  hindocellar diameter, distance between hindocelli equal to  $0.3 \times$  hindocellar diameter; eye height equal to  $1.04-1.10 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 1338). Dorsal length of flagellomere I  $2.2 \times$  apical width, of flagellomere IX  $1.2 \times$  apical width. Mandible: trimmal carina with minute incision shortly beyond midlength. Length 7.0-8.1 mm; head width 2.0-2.2 mm.

♂.— Upper interocular distance equal to  $0.68 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6 \times$  hindocellar diameter; eye height equal to  $1.00 \times$  distance between eye notches. Free margin of clypeal lamella angulate, about rectangular (Fig. 1339). Dorsal length of flagellomere I  $2.0 \times$  apical width, of flagellomere X  $1.2 \times$  apical width. Sternum III with basomedian tubercle in holotype (as described and illustrated by Krombein, 1949:407 and 1950:134), but simple in two specimens examined determined by him). Apical margin of sternum VIII broadly, shallowly emarginate (Fig. 1341). Genitalia: Figs. 1342, 1343. Length 5.6-6.8 mm; head width 1.6-1.7 mm.

**GEOGRAPHIC VARIATION.**— In the population from Guam, the punctures of the frons are minute but well defined, and at most gastral tergum I has a silvery, setal fascia. In specimens from Rota Island (described as *P. oakleyi rotaense* by Tsuneki, 1968b), the punctures of the frons are microscopically small and practically indistinguishable from the surrounding microsculpture, and silvery fasciate are terga I and II in the female, and I-IV in the male. I cannot confirm the differences in the propodeum sculpture described by Tsuneki (1968b).

**GEOGRAPHIC DISTRIBUTION** (Fig. 1344).— Known only from Guam and Rota, two adjacent islands in the Mariana Archipelago.

**RECORDS** (Krombein, 1949 or as indicated).—

**MARIANA ISLANDS:** **Guam:** Haputo Point, Machanao, Mount Alutom (1 ♀, USNM, allotype of *Pison oakleyi*), Mount Santa Rosa (1 ♂, CAS), North Field, Pilgo River (1 ♀, CAS), Point Ritidian (4 ♀, BISH; 1 ♀, CAS; 1 ♀, USNM, paratype of *Pison oakleyi*), Talofofo, Tarague, no specific locality (1 ♂, USNM, paratype of *Pison oakleyi*; 2 ♀, 1 ♂, BISH). **Rota Island:** Sabana, no specific locality (1 ♀, 1 ♂, BISH, paratypes of *Pison. oakleyi rotaense* Tsuneki).



FIGURE 1344. Collecting localities of *Pison oakleyi* Krombein.

### *Pison ponape* Krombein

Figures 1345-1349.

*Pison ponape* Krombein, 1949b:405, ♀. Holotype: ♀, Federate States of Micronesia: Island of Pohnpei (formerly Ponape): Colonia (USNM). Paratypes examined. — Krombein, 1949b:385 (in key to Sphecidae of Micronesia); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 144 (bibliographic reference to original description, description of ♂; Caroline Islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae).

**RECOGNITION.**— *Pison ponape* closely resembles *P. marginatum*. Like that species, it is all black and has three submarginal cells, the second recurrent vein interstitial with the second intersubmarginal vein, the setae appressed on tergum I and sinuous and slightly longer than the midocellar diameter on the lower gena, and most thoracic setae silvery (scutal setae brownish). Contrary to the other Pacific Islands species with this character combination, the two species have sternum II densely punctate mesally (although the punctures are about 2-3 diameters apart in *P. marginatum* and 3-4 diameters in *ponape*). Unlike *P. marginatum*, *P. ponape* has at most the first two terga with silvery, apical fasciae, and no such fasciae in some specimens (rather than terga I-IV fasciate), and the punctures of the upper frons average about 2-3 diameters apart (Fig. 1345) rather than 1-2 diameters. Unlike *P. mariannense*, the apex of the marginal cell is markedly closer to the wing apex than that of the third submarginal cell (rather than being about equidistant). *Pison ponape* differs from *P. trukense* in the sculpture of the propodeum which has a well-defined longitudinal carina that separates the side from the dorsum and the posterior surface, and the median sulcus on the dorsum is well-defined, without transverse carinae. Also, the setae of the propodeal dorsum are not conspicuous. In *P. trukense*, the longitudinal carina on the propodeal dorsum is ill-defined and present only along the posterior half (but not along the posterior surface), the middle sulcus is evanescent and crossed by short, transverse carinae, and the setae of the dorsum are conspicuous.

**DESCRIPTION.**— Frons punctate, punctures of medium size, about 2-3 diameters apart on upper frons, interspaces microareolate, dull (Fig. 1345). Distance between antennal socket and orbit minimally greater than socket diameter. Gena narrow in dorsal view (Fig. 1346). Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $2.5 \times$  midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, unevenly distributed (less than one diameter apart to several diameters apart); interspaces aciculate. Tegula not enlarged. Mesopleural punctures well defined, less than one diameter apart in one specimen examined, in the other averaging about one diameter apart near center. Postspiracular carina present, about  $2 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with irregular longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum not ridged, punctate, punctures about 2-3 diameters apart in middle portion, less than one diameter apart laterally (Fig. 1347); side punctate (punctures up to about one diameter apart near center) and with evanescent ridges; posterior surface with well-defined, transverse ridges, finely punctate between ridges (Fig. 1348). Posteroventral forefemoral surface with sparse, microscopic punctures. Hindcoxa dorsum with outer margin sharply carinate in posterior half. Punctures of tergum I fine, averaging 2-3 diameters apart in one specimen examined, in the other 3-4 diameters apart. Punctures of sternum II fine, about 3-4 diameters apart mesally.

Setae silvery, erect on frons (slightly longer than  $0.5 \times$  midocellar diameter), appressed on postocellar area, on lower gena sinuous and slightly longer than midocellar diameter, on scutum dark and inclined posterad (about  $0.5 \times$  midocellar diameter mesally, about 1 midocellar diameter laterally), appressed on tergum I, not concealing integument on clypeus. Apical depression of tergum I with silvery, setal fascia in most specimen, but with tergum I and II fasciate in some specimens, and terga nonfasciate in female from Tamon, Island of Pohnpei.

Body all black.

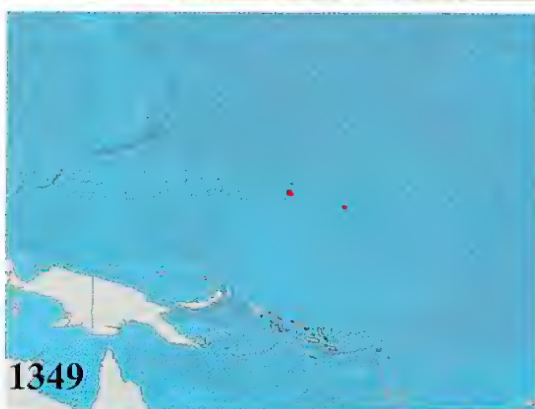
♀.— Upper interocular distance equal to  $0.5 \times$  lower interocular distance; ocellocular distance equal to  $0.4 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7 \times$  hindocellar diameter; eye height equal to  $1.0 \times$  distance between eye notches. Free margin of clypeal lamella obtusely angulate. Dorsal length of flagellomere I  $2.8 \times$  apical width, of flagellomere IX  $1.9 \times$  apical





FIGURES 1345-1348. *Pison ponape* Krombein, female. (1345) Upper frons; (1346) Head in dorsal view; (1347) Propodeal dorsum; (1348) Propodeal posterior surface.

FIGURE 1349. Collecting localities of *Pison ponape* Krombein.



width. Mandible: trimmal carina with minimal incision at about midlength. Length 10.5 mm; head width 2.9 mm.

♂.— Yasumatsu's (1953) description of the male contains only the differences between this sex and the female. I was not able to examine it.

#### GEOGRAPHIC DISTRIBUTION (Fig. 1349).—

Known from two Pacific islands: Kosrae (formerly Kusai) and Pohnpei (formerly Ponape).

**RECORDS.— FEDERATE STATES OF MICRONESIA:** Island of Kosrae: Mutunlik (2 ♀, BISH). Island of Pohnpei: airfield (1 ♀, BISH), Choptokoi (1 ♀, BISH, paratype of *Pison ponape*), Kolonia, formerly spelled Colonia (1 ♀, BISH; 2 ♀, USNM, paratypes of *Pison ponape*), Metalanim (1 ♀, BISH), Nanponmal (3 ♀, BISH), Peipalap Peak (1 ♀, BISH), Tamon (1 ♀, BISH, paratype of *Pison ponape*), Tamon-Reitao (1 ♀, BISH, paratype of *Pison ponape*), Tolocolme (Krombein, 1949b), no specific locality (1 ♀, BISH).

*Pison reichingeri* Kohl

Figures 1350-1361.

*Pison reichingeri* Kohl, 1908:309, ♀, ♂ (as *Reichingeri*, incorrect original capitalization). Lectotype: ♀, Samoa: Upolu (NHMW), **present designation**, examined. — R. Turner, 1916b:627 (diagnostic characters), 1919a:338 (Fiji), 1919b:239 (New Caledonia); Perkins and Cheesman, 1928:26 (as new synonym of *Pison tahitense*); Dollfuss, 1989:11 (type material in NHMW); Kami and Miller, 1998:57 (in checklist of Samoan insects).

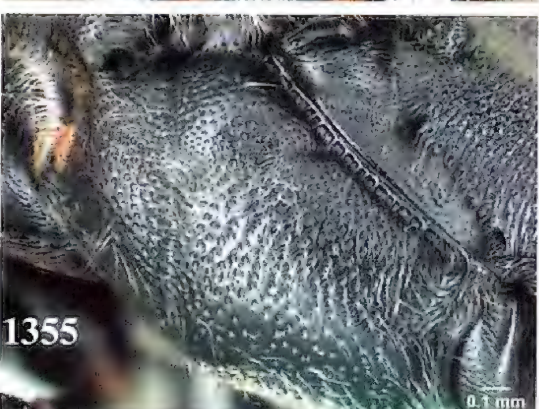
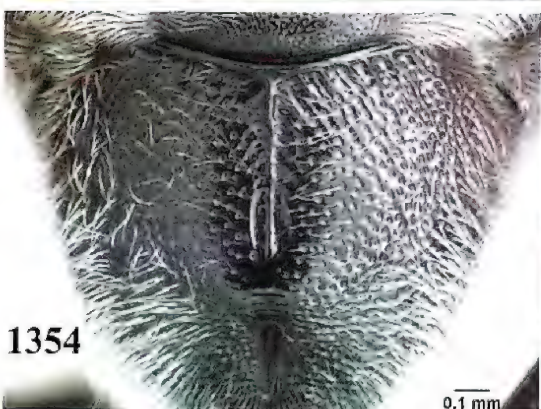
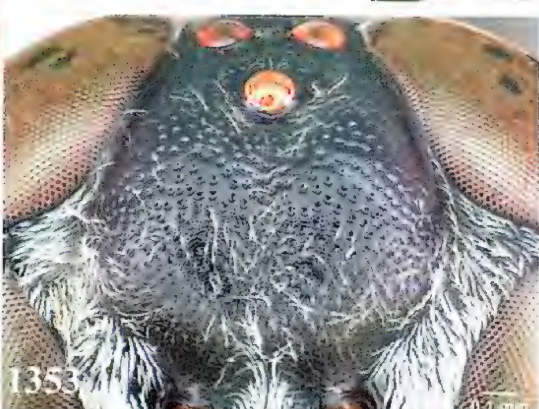
**LECTOTYPE DESIGNATION.**— The species was described from five females and two males according to the original description, but three females and three males are found in the NHMW, each labeled "*Pison Reichingeri* Type, det. Kohl", in Kohl's handwriting. I have selected one female as the lectotype, and the remaining specimens as the paralectotypes.

**RECOGNITION.**— *Pison reichingeri* can be recognized by the following character combination: setae of the head and thorax silvery, appressed on scutum and tergum I, slightly sinuous on lower gena and about as long as  $1.0\text{--}1.5 \times$  midocellar diameter, not concealing the integument on the female clypeus; second recurrent vein interstitial with second intersubmarginal vein or nearly so; tibial spurs black; mesopleural punctures well defined; punctures of the propodeal dorsum (Fig. 1356) less than one diameter apart (in some specimens punctures several diameters apart adjacent to the midline); most punctures of the propodeal side about one diameter apart; posterior propodeal surface punctate dorsally, with several transverse ridges ventrally; punctures of sternum II microscopic, mesally many diameters apart or absent (Fig. 1357), and at least terga I-II (I-III in female) with silvery, setal fasciae apically. *Pison trukense* is similar, but differs in having the punctures of the propodeal dorsum (Fig. 1375) more than one diameter apart except laterally, posterior propodeal surface with well-defined transverse ridges, and only tergum I with silvery apical fascia. Also similar is *P. novocaledonicum* in which, however, the punctures of the propodeal dorsum are more than one diameter apart, the apical margin of male sternum VIII is truncate, and the wings are markedly infumate. In *P. reichingeri*, either all punctures of the propodeal dorsum are less than one diameter apart or only those adjacent to the midline are more than one diameters apart, the apical margin of male sternum VIII is shallowly, broadly emarginate, and in most specimens the wings are slightly infumate.

**STATUS OF THE SPECIES.**— Without seeing the types of either species, Perkins and Cheesman (1928) synonymized *Pison reichingeri* with *tahitense* (i.e., *marginatum*), an opinion accepted by Williams (1947), Krombein (1949b), and Yasumatsu (1953). This synonymy, however, is incorrect, as the two species clearly differ by the sculpture of sternum II: in *reichingeri*, the punctures are microscopically small mesally and many diameters apart, whereas in *marginatum* they are well defined, 2-3 diameters apart on the disk and 1-2 diameters apart on the apical depression. Also different is the male clypeus: in *reichingeri*, the lamella is angulate laterally, and not angulate in *marginatum* (compare Figs. 1351, 1352 and 631).

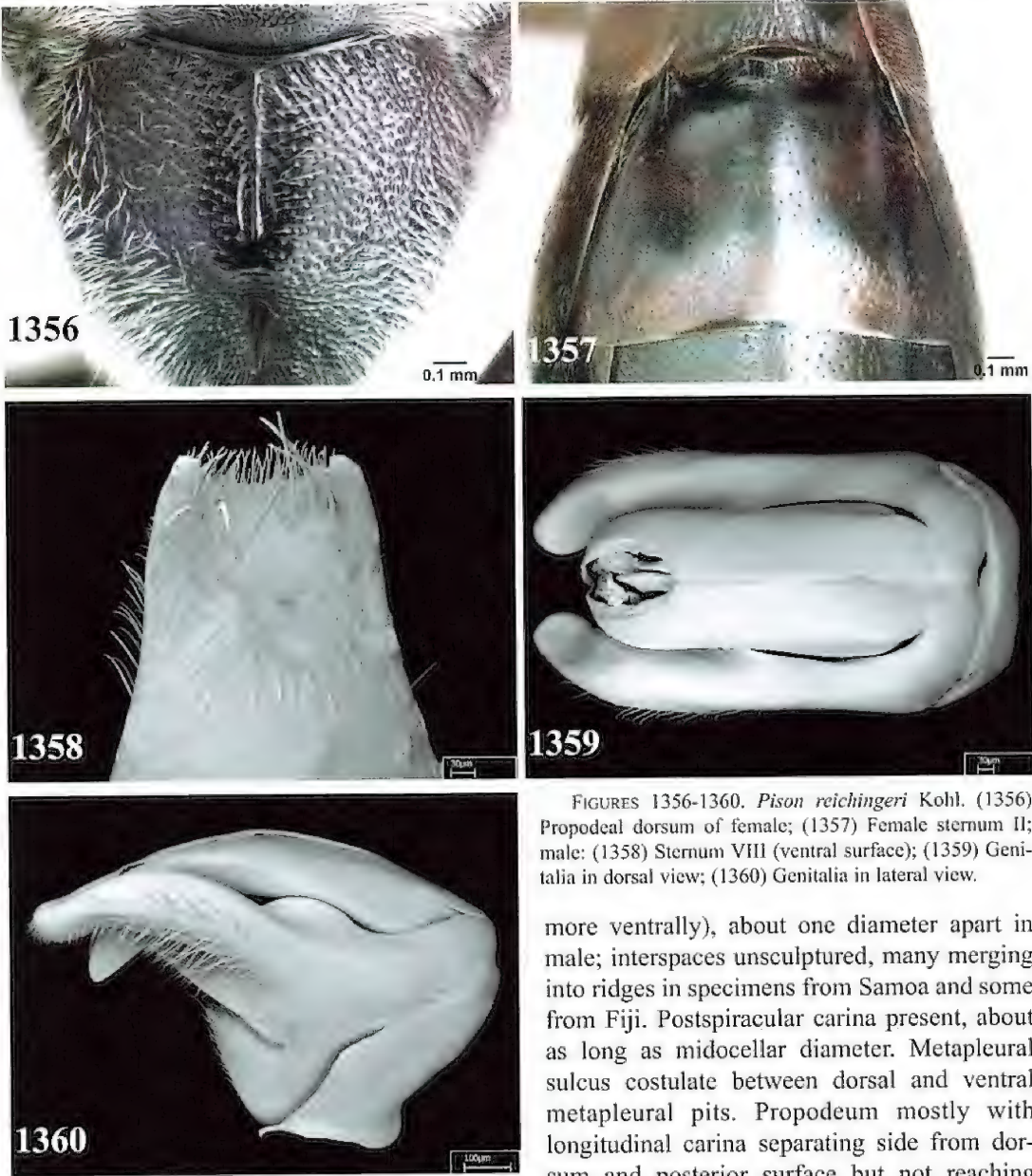
**DESCRIPTION.**— Frons microscopically areolate but somewhat shiny, with well-defined punctures that average 1-3 diameters apart in females (Fig. 1353) and some males, but about 1 diameter apart in other males. Gena narrow in dorsal view, particularly in female (Fig. 1354). Labrum entire to narrowly, shallowly emarginate. Anteromedian pronotal pit transversely elongate, about as long as  $2.5 \times$  midocellar diameter. Propleuron varying from punctate to largely impunctate. Scutum not foveate along flange, without short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, averaging about one diameter apart, but many punctures on disk up to 2-3 diameters apart; interspaces with evanescent microsculpture. Tegula minimally enlarged. Mesopleural punctures well defined (Fig. 1355), in female averaging 1-2 diameters apart (slightly





FIGURES 1350-1355. *Pison reichingeri* Kohl. (1350) Female clypeus and mandibles; (1351) Clypeus and mandibles of male from Fiji; (1352) Clypeus and mandibles of male from Samoa; (1353) Upper frons of female; (1354) Propodeal dorsum of female; (1355) Female mesopleuron.





FIGURES 1356-1360. *Pison reichingeri* Kohl. (1356) Propodeal dorsum of female; (1357) Female sternum II; male; (1358) Sternum VIII (ventral surface); (1359) Genitalia in dorsal view; (1360) Genitalia in lateral view.

either gastral socket area or spiracle (carina ranging from absent to well defined, evanescent in most specimens); dorsum with shallow median sulcus crossed by small transverse or oblique ridges (Fig. 1356), in most specimens with median carina limited to basal quarter of dorsum; dorsum surface with well-defined punctures less than one diameter apart except in some specimens from Fiji, Loyalty Islands, and Samoa punctures several diameters apart adjacent to midline; interspaces merging into small ridges (except posteriorly in some specimens); side finely punctate, punctures 1-2 diameters apart except less than one diameter apart posteroventrally, interspaces merging into inconspicuous ridges; posterior surface punctate dorsally, with several transverse ridges ventrally. Posteroventral forefemoral surface with fine punctures that average a few diameters apart.



Hindcoxal dorsum with outer margin carinate only preapically. Punctures of tergum I averaging about 2-3 diameters apart on disk of horizontal part. Punctures of sternum II fine to microscopic, many diameters apart mesally, somewhat larger and markedly denser near lateral margin (Fig. 1357)

Setae silvery, suberect to erect and variously oriented on frons (no appressed setae there), as long as one midocellar diameter or slightly longer in female, slightly shorter in male, appressed on scutum and tergum I; not concealing integument on clypeus in female, nearly completely concealing in male; on lower gena suberect, slightly sinuous, about as long as  $1.0-1.5 \times$  midocellar diameter (at least near occipital carina). Apical depressions of terga I-III with silvery, setal fasciae in female (tergum IV with inconspicuous fascia in females from Fiji), at least terga I-II in male.

Body black, mandible dark brown mesally.

♀.—Upper interocular distance equal to  $0.48-0.56 \times$  lower interocular distance; ocellular distance equal to  $0.2-0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5-0.7 \times$  hindocellar diameter; eye height equal to  $1.02-1.04 \times$  distance between eye notches. Free margin of clypeal lamella prominently arcuate (Fig. 1350). Dorsal length of flagellomere I  $2.6-2.9 \times$  apical width, of flagellomere IX  $1.6 \times$  apical width. Mandible: trimmal carina with small incision at about midlength. Tergum VI with median carina preapically. Length 8.1-11.3 mm; head width 2.2-3.1 mm.

♂.—Upper interocular distance equal to  $0.56-0.64 \times$  lower interocular distance; ocellular distance equal to  $0.3-0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6-0.8 \times$  hindocellar diameter; eye height equal to  $1.00-1.10 \times$  distance between eye notches. Free margin of clypeal lamella varying: truncate with minimal median projection in most specimens from Samoa (Fig. 1352), obtusely angulate and concave on each side of midpoint in those from Fiji (Fig. 1351). Dorsal length of flagellomere I  $2.3-2.5 \times$  apical width, of flagellomere X  $1.5-1.6 \times$  apical width. Sternum VIII shallowly, broadly emarginate apically (Fig. 1358). Genitalia: Figs. 1359, 1360. Length 6.5-9.3 mm; head width 1.9-2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1361).—Cook Islands, Fiji, French Polynesia, Kiribati, Marshall Islands, Niue Island, Samoa, Tonga Islands.

**RECORDS.**—**COOK ISLANDS:** Aitutaki Lagoon: Aitutaki (6 ♀, 1 ♂, BISH)

**FIJI:** no specific locality (1 ♂, BMNH). **Cicia Island:** Mabula (1 ♀, BISH). **Kioa Island:** no specific locality (1 ♀, BISH). **Lakeba Island:** Tobou (1 ♂, BISH). **Moala Island:** Naroi (1 ♀, 1 ♂, BISH). **Ovalau Island:** Levuka (1 ♂, BISH). **Taveuni Island:** Waiyevo (1 ♂, BISH), no specific locality (1 ♀, BMNH). **Vanua Levu:** Savusavu (1 ♂, BISH). **Viti Levu:** Colo-i-Suva Forest Park including Tholo-i-Suva (9 ♀, BISH; 3 ♀, BMNH), Kalekana to Mount Korobaba (1 ♀, BISH), Lami (6 ♀, 1 ♂, BISH), Nadarivatu (1 ♀, BISH), Nadi (1 ♀, USNM, determined as *Pison tahitense* by Krombein), Nausori Highlands (1 ♀, BISH), Rewa (2 ♀, 1 ♂, BISH; 1 ♀, BMNH), 10 km E Sigatoka (4 ♀, 6 ♂, CAS), Suva (1 ♀, BISH; 1 ♀, 1 ♂, BMNH; 6 ♀, 1 ♂, RMNH), Wainibuka (1 ♀, ANIC), Waingaitu (1 ♂, USNM, determined as *Pison tahitense* by Krombein).

**FRENCH POLYNESIA:** **Austral Islands:** Raivavae (2 ♀, BISH), Rurutu (4 ♀, 2 ♂, BISH; 1 ♂, BMNH), Tubuai (1 ♀, BISH). **Marquesas Islands:** Hiva Oa: Hanaiapa Valley (3 ♀, BISH).

**KIRIBATI:** Butaritari Island: no specific locality (1 ♀, 1 ♂, BISH). **Gilbert Islands:** Bairiki Island (1 ♀, 4 ♂, BISH).

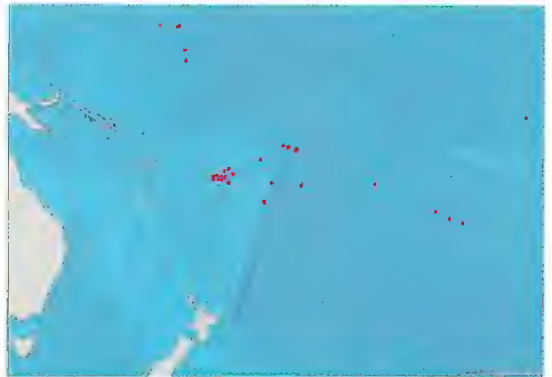


FIGURE 1361. Collecting localities of *Pison reichingeri* Kohl

**MARSHALL ISLANDS:** Ailinglaplap Atoll: Bigatyelang Island (1 ♀, USNM, determined as *Pison tahitense* by Krombein). Arno Atoll: Ine Island (1 ♀, BISH), Kirage Island (1 ♀, BISH).

**NIUE ISLAND:** no specific locality (1 ♂, BISH).

**SAMOA:** no specific locality (1 ♀, AMNH; 1 ♂, BMNH; 1 ♀, 1 ♂, CAS, paralectotypes of *Pison reichingeri*; 2 ♀, 2 ♂, NHMW, lectotype and paralectotypes of *Pison reichingeri*). Aunu'u Island: no specific locality (4 ♀, BISH). Savaii Island: no specific locality (7 ♀, 1 ♂, RMNH). Tutuila Island: Auala – Afono (1 ♂, BISH), Fagasa Trail (1 ♀, BISH), Taputimu (2 ♀, BISH), Vaitogi (3 ♂, BISH), no specific locality (1 ♀, BISH). Upolu Island: Apia (3 ♀, BISH; 2 ♂, BMNH), Mulivai (1 ♀, BISH), Tapatapao (1 ♂, USNM, determined as *Pison tahitense* by Krombein).

**TONGA ISLANDS:** Eua Island: Pangai (1 ♀, 1 ♂, BISH). Niuafu'ou Island: road to Jerusalem (1 ♀, UCD). Tongatapu Island: Ha'amonga (2 ♂, BISH), Nuku'alofa (2 ♀, 1 ♂, BISH), no specific locality (1 ♂, RMNH). Vavau Island: Neiafu (4 ♀, 6 ♂, BISH).

### *Pison suspiciosum* F. Smith

Figures 1362-1369.

*Pison suspiciosum* F. Smith, 1858a:104, ♀ (as *suspiciosus*, incorrect original termination). Holotype by monotypy: ♀, Singapore (OXUM), examined. – F. Smith, 1863b:135 (known from Singapore), 1869:291 (in checklist of *Pison*), 1871:366 (in catalog of Oriental Aculeata); Kohl, 1885:188 (in checklist of world *Pison*); Cameron, 1889:118 (in checklist of Oriental *Pison*); Bingham, 1897:219 (in revision of Indian and Pakistani aculeates); Dalla Torre, 1897:713 (in catalog of world Hymenoptera); Rothney, 1903:104 (India: West Bengal: Barrackpore); Turner, 1916b:625 (as new synonym of *Pison punctifrons*); Pagden, 1934:461 (Malay Peninsula; nests build of mud; prey: mainly immature *Pardosa* sp., Lycosidae, and a few immature Attidae); Iwata, 1964b:375 (nesting habits in Thailand).

*Pison fabricator* F. Smith, 1869:297, ♀. Holotype: ♀, China: Hong Kong (BMNH), examined. **New synonym.** – Kohl, 1885a:186 (in checklist of world *Pison*); Dalla Torre, 1897:711 (in catalog of world Hymenoptera); Strand, 1913b:164 (Taiwan, redescription); Turner, 1916b:625 (as new synonym of *Pison punctifrons*); Sonan, 1927:136 (Taiwan), 1931:7 (Pescadore Islands); Yasumatsu, 1933:265 (Japan: Island of Ishigaki), corrected to *Pison punctifrons* by Tsuneki, 1982g:60; Katayama, 1934:225 (nesting habits).

*Pison striolatum* Cameron, 1897:82, ♀. Holotype by monotypy: ♀, India: Uttarakhand: Mussooree (OXUM), examined. **New synonym.** – Bingham, 1897:220 (in revision of Indian and Pakistani aculeates); Turner, 1916b:625 (as new synonym of *Pison punctifrons*); S. Gupta, 1995:86 (India: Uttar Pradesh).

*Pison lagumae* Ashmead, 1904:131, ♂. Holotype: ♂, Philippines: Luzon: Laguna de Bay (USNM). **New synonym.** – Ashmead, 1904d:150 (listed); R. Brown, 1906:687 (in catalog of Philippine Hymenoptera); R. Turner, 1916b:625 (probably a synonym of *Pison punctifrons*); Swezey, 1942:185 (Guam); Giner Mari, 1945c:857 (India: Maharashtra: Bandra); Krombein, 1949b:400 (as new synonym of *Pison punctifrons*).

*Pison javanum* Cameron, 1905:63, ♂ (as *javanus*, incorrect original termination). Holotype or syntypes: ♂, Indonesia: Java: Tjandi near Semarang (Amsterdam). **New synonym.** – R. Turner, 1916b:625S (as new synonym of *Pison punctifrons*).

*Pison japonicum* Gussakovskij, 1937:627, ♂. Holotype: ♂, Japan: no specific locality (ZIN). **New synonym.** – Tsuneki, 1964:49 (as new synonym of *Pison punctifrons*).

As *Pison punctifrons*: Bingham, 1897:219 (in revision of Indian and Pakistani aculeates), 1908:355 (India: Purneah, now Purnia); Turner, 1916b:595 (in key to *Pison* of India), 625 (synonymy); Maidl, 1925:390 (Indonesia: Sumatra); Yasumatsu, 1935:236 (in revision of Japanese *Pison*: Honshu, Amami Oshima and Bonin Islands), 1936:361 (Bonin = Ogasawara Islands), 1937:134 (Carolina Islands: Palau Islands); Iwata, 1939:170 (nesting habits, in Japanese); Yasumatsu, 1939:83 (in key to *Pison* of eastern Asia, in checklist of *Pison* of Japanese Empire; Krombein, 1949b:384 (in key to Sphecidae of Micronesia), 400 (Marshall, Mariana, and Caroline Islands), 1950b:139 (additional Micronesian localities); Yasumatsu, 1953:134 (in list of *Pison* of Pacific islands), 145 (bibliographic references; Micronesia); Iwata and Yoshikawa, 1961:399 (Thailand); Tsuneki, 1962:5 (Japan: Ryukyu Islands: Island of Amami-Oshima); Iwata, 1964b:5 (nesting habits); Tano, 1964:38 (Japan: Kyushu: Island of Yakushima); Tsuneki, 1964:49 (in key to Trypoxylini of Japan; Japan, Korea; synonymy); Baltazar, 1966:335 (in catalog of Hymenoptera of Philip-



pines); Tsuneki, 1967d:20 (Taiwan); Haneda, 1968a:44 (Japan), 1968b:55 (Japan: Nagano Prefecture: Ina District); Tsuneki, 1968c:54 (Taiwan), 1970:8 (nesting habits); Haneda, 1971:31 (Taiwan); Tsuneki, 1971:19 (Taiwan); Yamada, 1971:35 (Japan: Aichi Prefecture); Haneda, 1972:5 (Taiwan); Tano, 1972:24 (Japan: Ryukyus Islands); Haneda, 1973:30 (Japan: Bonin Islands: Chichijima Islands); Murota, 1973a:101 (Japan: Ryukyus Islands: Amami Group), 1973b:117 (Taiwan); Tsuneki, 1974:636 (Thailand); Nambu, 1975:62 (Japan: Saitama Prefecture); Tsuneki, 1976:94 (Philippines), 1977:277 (Taiwan), 1982b:16 (known from Korea), 1982c:60 (known from the Ryukyu archipelago), 1982d:10 (Taiwan), 1983a:86 (Philippines), 102 (in key to *Pison* of Philippines), 1983c:42 (in key to *Pison* of New Guinea), 1984a:4 (Ogasawara = Bonin Islands); Paik, 1985:199 (in list of Sphecidae of Korea); Radović, 1985:65 (sting apparatus analyzed); Takahashi 1993:3 (Japan: Island of Hachijo-Jima); Miyatake, 1996:101 (specimens in Hiroshi Aoki collection); Wu and Zhou, 1996a:100 (in revision in Economic Insect Fauna of China); Porter, Stange, and Wang, 1999:9 (in checklist of Sphecidae of Taiwan); Yamane, Ikudome, and Terayama, 1999:529 (in Identification Guide to Crabronidae of Nansei = Ryukyu Islands, Japan); Lee and Shin, 2000:24, 25, 27 (Korea: Suwon and Kwangju-gun); Krombein and Norden, 2001:276 (nesting habits); Haneda, Nosaka, Tano, Kurokawa, and Murota, 2004:32 (Japan: Gifu Prefecture), 2005:47 (Japan: Gifu Prefecture); Hua, 2006:282 (in list of Chinese insects, geographic distribution); Haneda, Nozaka, Tano, Kurokawa, H. Murota, and T. Murota, 2007:54 (Japan: Amami Oshima Islands); Terayama and Nambu, 2009:2, 23 (in key to Trypoxylini of Japan); Takahashi, 2010:19 (Japan: in list of Hymenoptera of Ogasawara = Bonin islands); Haneda, 2011:46 (Philippines: Palawan); T. Li, and Q. Li, 2011:62 (in key to *Pison* of China); Kim, 2014:438 (in catalog of Sphecidae s.l. of Korean Peninsula).

As *Pison* sp.: Fullaway, 1913:283 (Guam), corrected to *Pison punctifrons* by Krombein, 1949b:400.

**INTERPRETATION OF *PISON SUSPICIOSUM*.**—Turner (1916b) synonymized *Pison suspiciosum*, *P. fabricator*, *P. striolatum*, and *P. javanum* with *Pison punctifrons*, as did Krombein (1949b) with *P. lagunae* and Tsuneki (1964) with *P. japonicum*. This interpretation has been followed by all the XX<sup>th</sup> and XXI<sup>st</sup> century authors. My examination of the holotypes of the first three species has demonstrated that they are indeed conspecific but clearly different from *P. punctifrons*. The latter species (whose holotype I have also examined) is actually the valid name for *P. nitidum*, *P. collare*, *P. papuanum*, and *P. bismarckianum*.

**RECOGNITION.**—*Pison suspiciosum* is characterized by the setae on tergum I erect combined with the conspicuously, coarsely punctate frons (some punctures as large as  $0.4 \times$  midocellar diameter) and conspicuously ridged propodeal dorsum. It resembles *P. punctifrons* and *P. pandambai*, but differs in having the propodeum with a longitudinal carina separating the dorsum from the side (carina rudimentary in some specimens, absent in the other two species), the hindcoxa dorsum with an insignificant tooth at the base of the inner carina (rather than prominent), and male sternum VIII conspicuously emarginate (Fig. 1366), rather than with a prominent median process. In many specimens the apical depression of tergum I is unsculptured mesally (rather than punctate throughout), and in most specimens tergum II (also following terga in many specimens) basolaterally has suberect setae about as long as the midocellar diameter (rather than appressed).

*Pison suspiciosum* is also similar to *P. atrum* (Spinola), a Western Palearctic and Afrotropical species. In *P. suspiciosum*, however, the propodeum has a longitudinal carina separating the dorsum from the side, the propodeal dorsum is obliquely ridged (punctate between ridges), the punctures of tergum IV are about as sparse as those of tergum II, and in many specimens the apical depression of tergum I is unsculptured. In *P. atrum* the propodeum lacks the longitudinal carina, the propodeal dorsum is punctate or punctatorugose, the punctures of tergum IV are denser than those of tergum II, and the apical depression of tergum I is punctate.

**JUSTIFICATION OF NEW SYNONYMY.**—Until now, *Pison suspiciosum*, *P. fabricator*, *P. striolatum*, *P. lagunae*, *P. javanum*, and *P. japonicum* were considered to be junior synonyms of *P. punctifrons*. I have examined the type specimens of the first three species and have found them to be

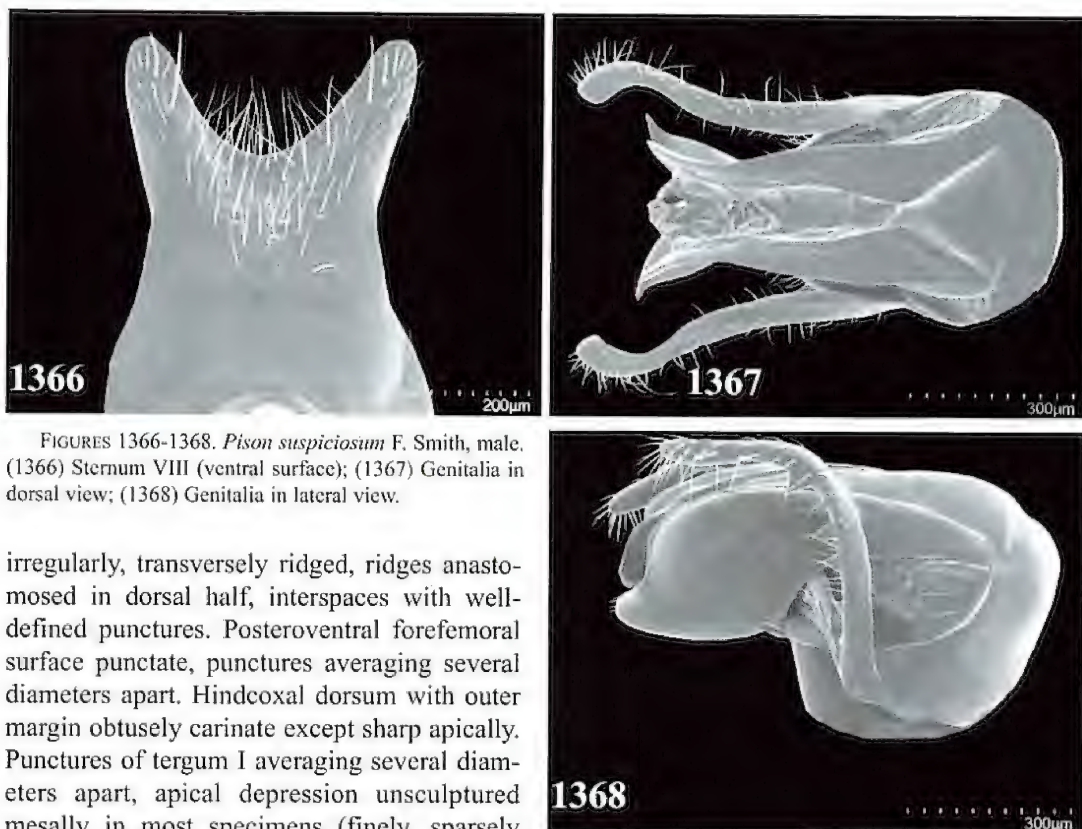


FIGURES 1362-1365. *Pison suspiciosum* F. Smith. (1362) Clypeus of female from Sabah; (1363) Clypeus of female from Taiwan; (1364) Male clypeus; (1365) Upper frons of female.

conspecific, but different from *P. punctifrons* (whose holotype I have also studied). I have not seen the types of *P. lagunae*, *P. javanum* and *P. japonicum*, which were synonymized with *P. punctifrons* (i.e., *P. suspiciosum*) by Krombein (1949b), Turner (1916b), and Tsuneki (1964), respectively. However, the origin of these types (clearly beyond the range of *P. punctifrons*), combined with a conspicuous punctation of the frons, convincingly supports their synonymy with *P. suspiciosum*.

**DESCRIPTION.**—Frons dull, conspicuously punctate (some punctures equal to  $0.4 \times$  midocellar diameter), punctures contiguous (Fig. 1365). Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about  $2.5 \times$  as long as midocellar diameter. Scutum not foveate along flange, with short longitudinal ridges adjacent to posterior margin; scutal punctures well defined, varying from 1-2 diameters apart to less than one diameter apart; interspaces unsculptured. Scutellum inconspicuously foveate along anterior margin. Tegula slightly enlarged. Mesopleural punctures well defined, mostly less than one diameter apart, but those near center about one diameter apart. Postspiracular carina present, about  $1.5 \times$  as long as midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface, but carina evanescent or absent in many specimens along posterior surface; dorsum conspicuously, obliquely ridged, punctate between ridges (ridges greatly reduced, present only in basal central half, in female from 19 km N Kalabakan, Malaysia); side with conspicuous punctures, in most specimens unsculptured except ridged anterodorsally and posteriorly, but all ridged in some; posterior surface





FIGURES 1366-1368. *Pison suspiciosum* F. Smith, male.  
(1366) Sternum VIII (ventral surface); (1367) Genitalia in  
dorsal view; (1368) Genitalia in lateral view.

irregularly, transversely ridged, ridges anastomosed in dorsal half, interspaces with well-defined punctures. Posteroventral forefemoral surface punctate, punctures averaging several diameters apart. Hindcoxal dorsum with outer margin obtusely carinate except sharp apically. Punctures of tergum I averaging several diameters apart, apical depression unsculptured mesally in most specimens (finely, sparsely punctate in most specimens from Singapore and some from Thailand, and those from Java and Laos); punctures of tergum IV about as sparse as those of tergum II. Sterna punctate throughout, punctures of sternum II well defined, averaging several diameters apart mesally.

Setae silvery, erect on upper frons, postocellar area, scutum, femoral venters, tergum I, and sternum II (on whole gaster in some populations, e.g., those from Thailand and Taiwan), on scutum slightly longer than midocellar diameter; on tergum II basolaterally, in most specimens, suberect, about as long as midocellar diameter (also on following terga in many specimens); on lower gena straight (slightly curved), up to  $2.0 \times$  midocellar diameter long; not concealing integument on clypeus in female, largely concealing in male. Apical depressions of terga in female with silvery setal fasciae loose, suberect, ill defined, absent in male.

Body all black.

♀.— Upper interocular distance equal to  $0.72-0.74 \times$  lower interocular distance; ocellocular distance equal to  $0.6 \times$  hindocellar diameter, distance between hindocelli equal to  $0.7-0.8 \times$  hindocellar diameter; eye height equal to  $0.94-1.00 \times$  distance between eye notches. Free margin of clypeal lamella in most specimens arcuate, nonprominent (Fig. 1362), but roundly triangular in those from Ambon and Halmahera islands, Indonesia, and in specimens from Japan, Taiwan, and China (Fig. 1363). Dorsal length of flagellomere I  $2.4-2.7 \times$  apical width, of flagellomere IX  $1.4 \times$  apical width. Length 6.0-8.5 mm; head width 1.9-2.4 mm.

♂.— Upper interocular distance equal to  $0.80-0.82 \times$  lower interocular distance; ocellocular distance equal to  $0.9-1.1 \times$  hindocellar diameter, distance between hindocelli equal to  $1.0-1.2 \times$  hindocellar diameter; eye height equal to  $0.92-0.96 \times$  distance between eye notches. Free margin

of clypeal lamella obtusely angulate (Fig. 1364). Dorsal length of flagellomere I  $1.9\text{--}2.0 \times$  apical width, of flagellomere X  $1.0\text{--}1.1 \times$  apical width. Sternum VIII conspicuously emarginate apically (Fig. 1366). Genitalia: Figs. 1367, 1368. Length 6.2–7.6 mm; head width 2.0–2.3 mm.

**NESTING HABITS.**— The nesting habits of *Pison suspiciosum* were observed by Katayama (1934, as *P. fabricator*) in Japan, by Pagden (1934, as *P. suspiciosum*) in Malaysia, by Iwata (1964, as *P. suspiciosum*) in Thailand, by Tsuneki (1970, as *P. punctifrons*) in Japan, and by Krombein and Norden (2001, as *P. punctifrons*) in Sri Lanka. Katayama listed the following prey: *Allagelena opulenta* (L. Koch), as *Agelena opalenta* L. Koch (Agelenidae), *Plexippoides doenitzi* (Karsch), as *Hasarius doenitzi* Karsch (Salticidae), and *Plexippus paykulli* (Audouin) (Salticidae). According to Pagden, the nests are found in houses, e.g., under the ledges of tables and windows, and are made out of mud, clearly in contradiction with the subsequent authors (suggesting that the species he observed was not *punctifrons*). The prey were chiefly immature *Pardosa* (Lycosidae) and a few immature Attidae. Iwata examined three nests, one in a beetle burrow in hard wood, and two in slender bamboo tubes. Individual cells contained 18 to 20 prey. The prey species were the following: Araneidae: *Argiope* sp.; Salticidae: *Menemerus fulvus* (L. Koch) (as *Menemerus confusus* Boesenberg and Strand), *Myrmarachne japonica* (Karsch), *Phintella versicolor* (C.L. Koch) (as *Jotus munitus* Boesenberg and Strand), *Plexippus paykulli* (Audouin), *Silerella vittata* (Karsch), nomen dubium; Tetragnathidae: *Tetragnatha squamata* (Karsch); Theridiidae: *Parasteatoda japonica* (Bösenberg & Strand) (as *Theridion japonicum* Boesenberg and Strand), *Parasteatoda tepidarium* (C. L. Koch) (as *Theridion tepidarium* C. Koch). Tsuneki observed three cells in the pith cavity of the *Miscanthus* grass of a thatched roof of an abandoned horse pen. Two cells were completed and sealed off, and they contained 22 and 24 unnamed young spider prey. The partitions between the cells were made of mud and they were very fragile. The third cell continued to be provisioned. Krombein and Norden used artificial nest consisting of wood blocks with a drilled hole. They examined a total of four nests; three of them contained two, three, and four larval cells, respectively, 11–13 mm long (including 0.5 mm mud plug); one nest contained two intercalary cells 6 and 20 mm long, respectively. One nest contained unidentified juveniles of *Cyrtophora* Simon? (Araneidae), a member of Oxyopidae, and of *Brettus* Thorell and *Rhene* Thorell (Salticidae).

Several cells observed by Iwata were infested with larvae of *Melittobia* sp. (Eulophidae) and a tachinid fly.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1369).— *Pison suspiciosum* is essentially an Oriental species (southern China, India, Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam), but it also occurs in Korea, on the island of Honshu, Japan, and on several of the Pacific Islands (Carolines, Hawaii, Mariana, Marshall, New Caledonia, and Palau Islands).

**RECORDS.**— CHINA (Hua, 2006): Guandong, Fujian, Hebei, Heilongjiang, and Jiangsu provinces: no specific localities). Also Fujian: Fuzhou (Turner, 1916b, as Foo Chow), Hong Kong (F. Smith, 1869), and Yunnan: Simao: Jingdong: Jingping at  $24^{\circ}24'N$   $100^{\circ}48'E$  (1 ♀, 1 ♂, CAS).

**FEDERATE STATES OF MICRONESIA** (Krombein, 1949, 1950; Yasumatsu, 1953, or as indicated): Fais Island (1 ♀, BISH), Falalop Island (3 ♀, BISH), Kosrae Island (as Kusaie): Mutunlik (1 ♀, BISH), Machiro Island, Pohnpei Island (formerly Ponape): Kolonia (1 ♀, BISH) and Tolenot Peak (1 ♀, BISH), Yap Island (1 ♀, BISH).

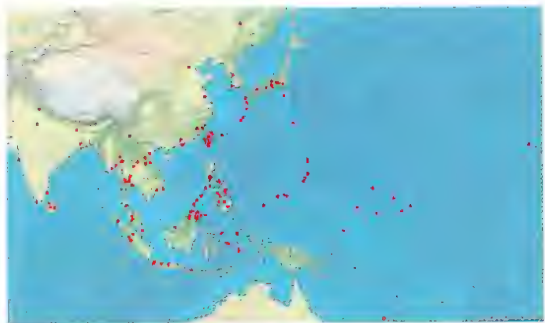


FIGURE 1369. Collecting localities of *Pison suspiciosum* F. Smith.



**HAWAIIAN ISLANDS:** Oahu: Waipio (1 ♀, BISH).

**INDIA:** Bihar: Purnia (Bingham, 1908). Kerala: Bonaccord (1 ♀, CAS). Maharashtra: Bandra, a southern suburb of Mumbai (Giner Mari, 1945). Rajasthan: Barathpur (1 ♀, 1 ♂, RMNH). Union Territory of Puducherry: Karaikal (1 ♀, RMNH). Uttarakhand: Mussoorie (Cameron, 1897, as *striolatum*). West Bengal: Barrackpore (Rothney, 1903).

**INDONESIA:** Ambon: Waai (1 ♀, BISH), no specific locality (1 ♂, BISH; 3 ♀, RMNH). Halmahera: between Payahe and Gila Woda (10 ♀, RMNH). Java: Ambarawa (4 ♀, RMNH), Bogor (2 ♀, RMNH), Bogor: Botgurd (1 ♀, BISH), Jakarta (3 ♀, 1 ♂, RMNH, as Batavia), Japara (1 ♂, RMNH), Semarang (1 ♂, RMNH), Tjandi near Semarang (Cameron, 1905), Wangoen (5 ♀, 3 ♂, RMNH), no specific locality (2 ♀, RMNH), also "G. Benbreng, Djombang Wetan" (1 ♂, RMNH). Lombok: Suranadi near Mataram (1 ♀, RMNH). Sula Islands: Mangole: near Buya (1 ♀, RMNH), Taliabu: near Tubang (1 ♀, RMNH). Sulawesi: Bogani Nani Wartabone National Park (3 ♀, BMNH, as Dumoga Bone National Park). Sumatra: Bukittinggi (Maidl, 1925, as Fort de Kock), Ketambe (3 ♀, RMNH), Pakanbaru (4 ♀, RMNH), western Sumatra: no specific locality (2 ♀, RMNH). Also specimens labeled "G. Besser, Djampang Wetan" (4 ♀, RMNH).

**JAPAN** (Yasumatsu, 1935 if not indicated otherwise): Honshu: Aichi Prefecture (Yamada, 1971), Gifu Prefecture (Haneda, Nosaka, Tano, Kurokawa, and Murota, 2004, 2005), Hachijo-jima Island in Izu Islands (Takahashi, 1993), Ikeda (Iwata, 1964), Ina District in Mount Haku in Ishikawa Prefecture (Tsuneki, 1970), Nagano Prefecture (Haneda, 1968), Kofu, Onomichi, Saitama Prefecture (Nambu, 1975). Kyushu: Amakusa Islands: Tomioka Tororo, Kagoshima. Ogasawara (= Bonin) Islands: no specific locality (Yasumatsu, 1936), Chichijima Island (1 ♀, 1 ♂, BISH). Ryukyu Islands (Tsuneki, 1982c or as indicated): Akagina on Amami Oshima Island (1 ♂, CAS), Akaogi on Amami Oshima Island (2 ♀, 2 ♂, CAS, 1 ♀, 1 ♂ determined as *Pison punctifrons* by K. Tsuneki, 1962), Nase (1 ♂, CAS), and Nishinakama on Amami Oshima Island (also Murota, 1973a), Tokunoshima Island (Tsuneki, 1968a), Yakushima Island (Tano, 1972). Yaeyama Islands: Ishigaki Island (Yasumatsu, 1933).

**KOREAN PENINSULA:** no specific locality (Tsuneki, 1982a). **SOUTH KOREA** (Lee and Shin, 2000; Kim, 2014): Gyeonggi Province: Kwangju-gun. Suwon Province: Mount Kwangkyo.

**LAOS:** Khammouane Province: Phon Tiou (1 ♀, BISH). Vientiane Province: Ban Van Eue (1 ♀, BISH).

**MALAYSIA (EAST):** Sabah: near Darum Valley Field Center (4 ♀, RMNH), forest camp 19 km N Kalabakan (2 ♀, 1 ♂, BISH), Kalabakan (2 ♀, 2 ♂, CAS), Kota Kinabalu (4 ♀, 2 ♂, CAS), Long Pasia (1 ♀, RMNH), Luasong (1 ♀, 2 ♂, CAS), Pangkalan Tebang (1 ♂, BISH), Payakalaba near Long Pasia (1 ♀, RMNH), Poring Hot Spring (1 ♂, CAS), Sebatik Island (1 ♀, CAS), Segaliud Lokan Forest Reserve (1 ♀, 1 ♂, CAS), Sepilok Forest Reserve (1 ♀, CAS), Silabukan Forest Reserve (1 ♂, CAS), Tawau (1 ♂, BISH), forest camp 9.8 km SW Tenom ((1 ♀, BISH), Tuaran (8 ♀, 8 ♂, CAS), Ulu Dusun (3 ♂, CAS). Sarawak: Kanowit (1 ♂, CAS). **MALAYSIA (WEST):** Johore: Ulu Sedili (1 ♀, CAS). Kelantan: no specific locality (1 ♀, CAS). Negeri Sembilan: Kuala Pilah (1 ♀, CAS). Perak: 25 km NE Ipoh at 4°49'N 101°13'E (1 ♀, CAS), 40 km SE Ipoh at 4°5'N 101°23'E (1 ♀, CAS).

**MARIANA ISLANDS** (Krombein, 1949; Yasumatsu, 1953, or as indicated): Agrihan Island, Guam: Point Oka (1 ♀, BISH, as Oca) and no specific locality (5 ♀, 6 ♂, BISH), Pagan Island, Rota Island (1 ♀, BISH), Saipan Island, Tinian Island.

**MARSHALL ISLANDS:** Arno Atoll: Inc (2 ♀, 3 ♂, BISH). Eniwetak: Bogombogo (1 ♂, BISH), Elugelab (1 ♀, BISH), Japtan Island (3 ♀, BISH), no specific locality (1 ♀, BISH). Jaluit Atoll: Elizabeth Island (1 ♀, BISH). Kwajalein Atoll (1 ♀, BISH).

**MYANMAR:** Rangoon (Turner, 1916b), Yunzalin valley (Turner, 1916b).

**NEW CALEDONIA:** Hienghène (1 ♂, BISH).

**PALAU REPUBLIC:** Babelthuap Island (Krombein, 1949b), Koror Island (Krombein, 1949b), Ngerekebesang Island (1 ♂, BISH).

**PHILIPPINES:** Cebu: Argao (Tsuneki, 1983a). Leyte: Todobaz (Tsuneki, 1983a). Luzon: Albay (Tsuneki, 1983a), Laguna de Bay and Manila (Ashmead, 1904, as *lagunae*; Baltazar, 1966), Los Baños (1 ♀, CAS), Marikina (1 ♀, CAS), Pili (1 ♀, CAS). Mindanao (Tsuneki, 1983a): Cagayan de Oro, Davao, Zamboanga. Mindoro: San José (1 ♂, CAS). Negros: Taytay beach (Tsuneki, 1983a). Palawan: 10 km S Balabac (1 ♀,

BISH), 6 km W Culion (1 ♀, BISH), Pingisan (Tsuneki, 1976), Puerto Princesa (1 ♂, CAS), 3 km NE Tinabog (1 ♀, BISH). **Samar:** Basey (Tsuneki, 1983a). **Tawi Tawi:** Tarawakan (Tsuneki, 1976).

**SINGAPORE:** Singapore (1 ♀, 2 ♂, CAS).

**SRI LANKA:** **Ampara District:** Ekgal Aru (1 ♂, CAS). **Anuradhapura District:** Anuradhapura (1 ♀, RMNH). **Kandy District:** Kandy (Krombein and Norden, 2001). No specific locality: 1 ♀, RMNH.

**TAIWAN** (Sonan, 1927; Tsuneki, 1967, 1968; Haneda, 1971, 1972; Murota, 1973b, Tsuneki, 1977, 1982b or as indicated): **Chiayi Hsien:** Talin (Strand, 1913, as Taihorin). **Nantou Hsien:** Puli. **Pintung Hsien:** Kankau (Strand, 1913), Kenting National Park (1 ♂, CAS), Manchou (3 ♀, CAS). **Taichung Hsien:** Taichung. **Tainan Hsien:** Anping (Strand, 1913), Ohinoherahu Island, Tainan (Strand, 1913). **Taitung Hsien:** Chih-penchi (1 ♂, CAS), Chulu (1 ♀, CAS, determined as *Pison punctifrons* by K. Tsuneki, 1972). **Taoyuan Hsien:** Kuangyin (2 ♂, CAS, 1 ♂ determined as *Pison punctifrons* by K. Tsuneki, 1971). **Yilan Hsien:** Erhchieh. **Penghu (= Pescadores) Islands** (Sonan, 1931). Also Chiayi and Paiho Hsien: no specific localities, and the following localities: Kagi, Kanshirei, Koroton, Taihanroku, Taihorinsho, Takao.

**THAILAND:** **Ayutthaya:** Ayutthaya (Tsuneki, 1974) **Bangkok:** Bangkok (Tsuneki, 1974). **Chiang Mai:** Chom Thong at 18°25'N 98°36'E (1 ♂, RMNH). **Kanchanaburi:** Kanchanaburi (2 ♀, CAS). **Lamphun:** Lamphun (Iwata and Yoshikawa, 1964) **Loei:** Wang Saphung at 17°18'N 101°46'E (1 ♀, CAS; 2 ♀, RMNH). **Mae Wong Son:** SE Soppong at 19°27'S 98°20'E (1 ♂, CAS). **Nakhon Ratchasima:** Korat (Iwata and Yoshikawa, 1964). **Rat Buri:** Rat Buri (1 ♀, BISH). **Rayong:** Ban Phe (2 ♀, CAS). **Tak:** Lang Sang National Park 19 km W Tak at 13°28'N 99°48'E (1 ♂, RMNH). **Trang:** Khao Chong National Park 18 km E Trang at 7°34'N 99°49'E (1 ♀, RMNH).

**VIETNAM:** **Dong Nai:** Cát Tiên National Park (9 ♀, 1 ♂, RMNH). **Ha Thin:** Trại Xái: Hê Gò Protected Forest at 18°08'N 105°57'E (1 ♀, 1 ♂, AMNH). **Nghê An:** Khe Bo (1 ♂, AMNH). **Ninh Binh:** Cúc Phú'o'ng National Park (2 ♀, RMNH). **Ninh Thuận:** Núi Chúa National Park (2 ♀, RMNH).

### *Pison tosawai* Yasumatsu

Figure 1370-1371.

*Pison tosawai* Yasumatsu, 1935:234, ♂. Holotype: ♂, Japan: Bonin Islands: Island of Chichijima (OMNH), examined. — Yasumatsu, 1936:361 (Bonin = Ogasawara Islands), 1939:82 (in key to *Pison* of eastern Asia), 84 (in checklist of *Pison* of Japanese Empire), 1953:135 (in list of *Pison* of Pacific islands); Tsuneki, 1964:49 (in key to Trypoxylini of Japan), 1984a:11 (known from Ogasawara = Bonin Islands), 1984:10 (redescription of ♂, description of ♀); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae); Terayama and Nambu, 2009:2, 24 (in key to Trypoxylini of Japan); Takahashi, 2010:19 (Japan: in list of Hymenoptera of Ogasawara = Bonin islands).

**RECOGNITION.**— *Pison tosawai* shares with *P. punctifrons* and *P. suspiciosum* the presence of erect setae on tergum I. It differs from these species in having the male clypeal lamella truncate apically (Fig. 1370) rather than pointed. Unlike *P. punctifrons*, it has the longitudinal carina separating the propodeal side from the dorsum and the posterior surface (carina absent in *P. punctifrons*), the apical depression of tergum I unsculptured (rather than finely punctate) and male sternum VIII deeply emarginate apically (rather than truncate). Unlike *P. suspiciosum*, the interspaces on the scutum are microsculptured and dull (rather than unsculptured and shiny, and the dorsal length of male flagellomere I is  $2.9 \times$  (rather than  $1.9\text{--}2.0 \times$ ).

**DESCRIPTION.**— Frons dull, with well-defined punctures that average less than one diameter apart mesally and laterally, about one diameter apart sublaterally; interspaces microareolate, middle supraantennal carina absent. Occipital carina joining hypostomal carina. Labrum minimally emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well-defined, averaging about two diameters apart; interspaces microareolate. Tegula not enlarged. Mesopleural punctures conspicuous, less than one diameter apart. Postspiracular carina present but inconspicuous, about as long as midocellar diameter. Metapleural sulcus costulate



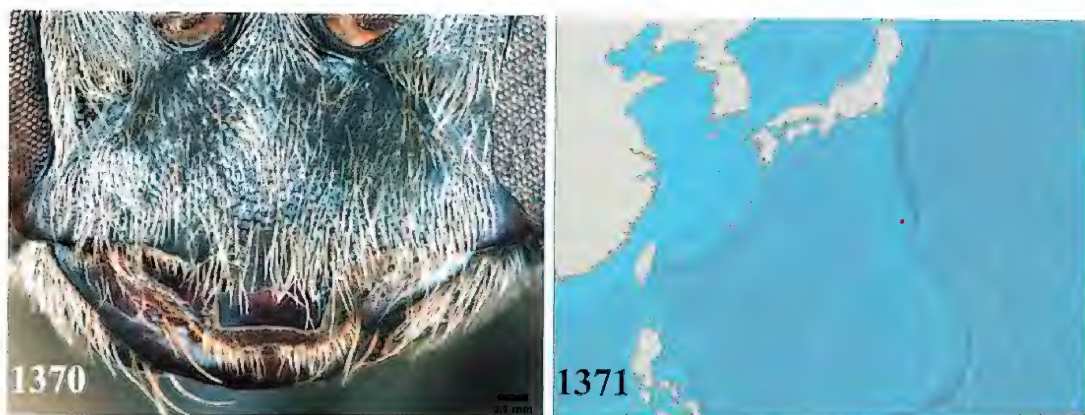


FIGURE 1370. *Pison tosawai* Yasumatsu, male. (1370) Clypeus.

FIGURE 1371. Collecting localities of *Pison tosawai* Yasumatsu.

between dorsal and ventral metapleural pits. Propodeum with longitudinal carina separating side from dorsum and posterior surface and extending from gastral socket area toward spiracle; dorsum obliquely ridged (ridges increasing in size laterally), with middle sulcus but without median carina; side punctatorugose; posterior surface irregularly, transversely ridged. Posteroventral forefemoral surface with well-defined punctures that are less than one diameter apart. Punctures of tergum I fine, several diameters apart on horizontal part, apical depression unsculptured, shiny. Sterna punctate throughout, punctures of sternum II averaging several diameters apart.

Setae silvery, erect on postocellar area, scutum, and tergum I, not concealing integument on clypeus, straight on lower gena; setal length about  $1.5 \times$  midocellar diameter on postocellar area,  $1.0 \times$  on scutum, and up to  $2.0 \times$  on lower gena. Terga without silvery, setal fasciae.

Body all black.

♀ (from Tsuneki, 1984b).— Ocellocular distance equal to  $0.5 \times$  hindocellar diameter; distance between hindocelli  $0.6 \times$  hindocellar diameter. Free margin of clypeal lamella arcuate. Length 9.5–11.0 mm.

♂.— Upper interocular distance equal to  $0.76 \times$  lower interocular distance; ocellocular distance equal to  $1.0 \times$  hindocellar diameter, distance between hindocelli equal to  $0.8 \times$  hindocellar diameter; eye height equal to  $1.06 \times$  distance between eye notches. Free margin of clypeal lamella truncate apically, truncation minimally concave (Fig. 1370). Dorsal length of flagellomere I  $2.9 \times$  apical width, of flagellomere X  $2.0 \times$  apical width. Sternum VIII conspicuously, deeply emarginate apically. Length 11.0 mm; head width 3.2 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1371). Known only from Island of Chichijima in the Ogasawara archipelago.

**RECORDS.**— JAPAN: Ogasawara Archipelago: Island of Chichijima: no specific locality (1 ♂, OMNH, holotype of *Pison tosawai*), Minimifukoroza (Tsuneki, 1984b).

### *Pison trukense* Yasumatsu

Figures 1372–1376.

*Pison trukense* Yasumatsu, 1953:147, ♀, ♂. Holotype: ♂, Caroline Islands: Chuuk Islands (formerly Truk): Tol: Olei (ELKU), examined. — Yasumatsu, 1953:136 (in list of *Pison* of Pacific islands); R. Bohart and Menke, 1976:336 (in checklist of world Sphecidae).

**RECOGNITION.**— *Pison trukense* can be recognized by the following combination: the setae of

the head and thorax are silvery, appressed on tergum I, on the scutum markedly shorter than the midocellar diameter, on the lower gena sinuous and slightly longer than the midocellar diameter; the second recurrent vein is interstitial with second intersubmarginal vein or nearly so; punctures of sternum II are minute, several diameters apart near the center; and the apex of the marginal cell is markedly closer to the wing apex than that of the third submarginal cell. Additionally, the punctures of the propodeal dorsum are more than one diameter apart except laterally (Fig. 1375), the posterior propodeal surface has well-defined transverse ridges, and only tergum I has a silvery apical fascia. *Pison reichingeri* is similar, but differs as follows: the punctures of the propodeal dorsum (Fig. 1356) are less than one diameter apart (in some specimens several diameters apart adjacent to the midline); the posterior propodeal surface is punctate dorsally, with several transverse ridges ventrally; and at least terga I-III have a silvery, apical fascia. *Pison novocaledonicum* is also similar, and differs mainly in having the dorsal half of the posterior propodeal surface punctate and not ridged.

**DESCRIPTION.**—Frons dull, microsculptured, with well-defined punctures that average up to two or more diameters apart in female, slightly more than one diameter apart in male (Fig. 1374). Gena narrow in dorsal view. Labrum not emarginate. Anteromedian pronotal pit transversely elongate, about as long as midocellar diameter. Scutum not foveate along flange, without longitudinal ridges adjacent to posterior margin; scutal punctures well defined, unevenly distributed (many punctures on disk several diameters apart, other punctures less than one diameter apart); interspaces unsculptured. Tegula not enlarged. Mesopleural punctures well defined, less than one diameter apart in some specimens, but in most specimens several punctures near center more than one diameter apart; interspaces unsculptured. Postspiracular carina present, slightly longer than midocellar diameter. Metapleural sulcus costulate between dorsal and ventral metapleural pits. Propodeum with carina between dorsum and side absent in some specimens, in others extending up to half height of posterior surface; most of dorsum unridged, punctate (punctures more than one diameter apart except laterally), with longitudinal ridges only at very base, and also with short transverse ridges along midline, middle sulcus evanescent (Fig. 1375); side unridged, with well-defined punctures that average about two diameters apart near center in female, in male about one diameter apart; posterior surface transversely ridged, punctate between ridges. Posteroventral forefemoral surface with minute punctures that average 2-3 diameters apart. Hindcoxal dorsum with outer margin sharply carinate near apex only. Punctures of tergum I fine, several diameters apart anterior of apical depression. Sterna punctate throughout, punctures of sternum II several diameters apart mesally.

Setae silvery, subappressed to suberect on upper frons, appressed on postocellar area, on scutum suberect but markedly shorter than midocellar diameter, appressed on tergum I; on lower gena sinuous, up to  $1.5 \times$  midocellar width; on clypeus not concealing integument in female, largely concealing in male. Apical depression of tergum I, and only laterally, with ill-defined silvery, setal fascia; other terga without such fasciae.

Body all black.

♀.—Upper interocular distance equal to  $0.48-0.50 \times$  lower interocular distance; ocellocular distance equal to  $0.3 \times$  hindocellar diameter, distance between hindocelli equal to  $0.6 \times$  hindocellar diameter; eye height equal to  $1.04-1.06 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 1372). Dorsal length of flagellomere I  $3.0-3.1 \times$  apical width, of flagellomere IX  $1.7 \times$  apical width. Mandible: trimmal carina with minuscule incision at about midlength. Tergum VI apically with median carina about as long as midocellar width. Length 8.2-9.0 mm; head width 2.5-2.7 mm.

♂.—Upper interocular distance equal to  $0.62 \times$  lower interocular distance; ocellocular distance





FIGURES 1372-1375. *Pison trukense* Yasumatsu. (1372) Female clypeus and mandibles; (1373) Male clypeus and mandibles; (1374) Upper frons of male; (1375) Propodeal dorsum of male.

FIGURE 1376. Collecting localities of *Pison trukense* Yasumatsu.



equal to  $0.5 \times$  hindocellar diameter, distance between hindocelli equal to  $0.5 \times$  hindocellar diameter; eye height equal to  $1.04 \times$  distance between eye notches. Free margin of clypeal lamella roundly arcuate (Fig. 1373). Dorsal length of flagellomere I  $2.6 \times$  apical width, of flagellomere X  $1.5 \times$  apical width. Sternum VIII emarginate apically. Length 8.7 mm; head width 2.4 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 1376).— Known only from the Chuuk Islands (formerly Truk) in the Caroline Archipelago.

**RECORDS.**— **FEDERATED STATES OF MICRONESIA: Chuuk Islands** (formerly Truk): Pata: Sabote-Epin (1 ♀, ELKU), Puluwat (= Enderby) Atoll (1 ♀, ELKU), Tol: Olei (1 ♂, ELKU, holotype of *Pison trukense*), Tol: Oley-Foup Epin (1 ♀, ELKU), Toloas Epin (1 ♀, ELKU), Toloas: Kutua Epin (2 ♀, ELKU).

## ACKNOWLEDGMENTS

I sincerely thank the curators who sent material under their care for study. My wife, Veronica E. Ahrens, helped collect specimens in Queensland (2006, 2007, 2012), Northern Territory (2008), Western Australia (2008), New South Wales (2009/2010, 2011/2012), and South Australia (2010/2011), as did Geoffrey A. Williams in Northern Territory (2008) and David M. Bray in Western Australia (2008). Mademoiselle Agni  le Touret-Alby (Mus  um National d'Histoire Naturelle, Paris, France) sent the digital images of the holotype of *Pison strictifrons* Vachal. Robert L. Zuparko, California Academy of Sciences, carefully read the entire manuscript, suggested many improvements, and eliminated many errors. Erin Prado (Oakland, California) generated color illustrations of external morphological characters using the Automontage software package by Syncroscopy, Michele Esposito, California Academy of Sciences, helped with Photoshop, and Scott Serata (then at the California Academy of Sciences) produced most of the Scanning Electron Microscope images, whereas Erika Garcia (Pacifica, California) provided the remaining ones. Jere Schweikert, California Academy of Sciences, generated a database, with latitude and longitude, of 2,463 localities mentioned in this paper, that Erica Garcia used to produce distribution maps. Darrell Ubick, California Academy of Sciences, kindly checked the validity of spider names. I want to thank Arnold Menke for his thoughtful review of the manuscript and for his comments and suggestions that helped improve the presentation. Last but not least, I am greatly indebted to Alan E. Leviton, California Academy of Sciences Editor of Scientific Publications, for his very professional handling of the manuscript and many excellent suggestions.

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